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Agricultural Gazette of New South Wales.

The Possible Extension of Wheat Production in Australia.

F. B. GUTHRIE.

IN the course of a recent article the Hon. James Ashton, discussing the local conditions brought about by the war, urged strongly the necessity of increasing the area devoted to crop production, more particularly wheat. This suggestion raises many important points for discussion, amongst which is the question, what land is available for the cultivation of grain in the State; or what are the limits of profitable wheat production?

The following notes may be of assistance in helping us to realise the problem presented. The tabulated figures have been supplied by Mr. J. B. Trivett, Government Statistician, to whom my best thanks are due. This gentleman is not, however, to be held responsible for any conclusions drawn, which are necessarily of a more or less theoretical nature.

If we base our considerations on the assumption that a rainfall of 10 inches during the growing season (April to October inclusive) may be regarded as the present limit of profitable wheat production, we have in the four principal wheat-producing States the following areas above that limit:—

	Square miles.
New South Wales	163,772
Victoria	74,616
South Australia	46,980
West Australia	93,500

The whole of this area is, of course, not suitable for wheat-growing. In New South Wales, for example, it is calculated that out of the 105,000,000 acres receiving over 10 inches during the growing season, only about one-quarter, or about 26,000,000 acres, can be profitably cultivated for wheat.

At the present time, and for the past ten years, the area harvested for grain has represented about 80 per cent. of the total area under wheat, the remainder being cut for hay and green feed. We must assume that this proportion will continue, so that of this 26,000,000 acres it may be assumed that a little under 21,000,000 acres will be the maximum area harvested for grain. At present only about 3,000,000 acres (3,140,000) are under cultivation for wheat. It is therefore possible, even under existing conditions, to increase the area for wheat production by over 17,750,000 million acres in New South Wales. If the average yield per acre of the past ten years (11·6 bushels) is maintained, this would mean a total harvest of over 243,000,000 bushels as against the 1913-14 harvest of 38,000,000 bushels.

Figures for the other States regarding the proportion of the area outside the 10-inch isohyet during crop growth are not available, as far as I am aware, but we may fairly assume that this proportion is much the same as in New South Wales, and that one-quarter of the area given in the preceding table can be made available. We shall then get the following figures for possible acreages and yields in the four principal wheat-producing States:—

	(1.) Area with over 10 inches Rain during growing season.	(2.) Area suitable for Wheat-growing (¼ of column 1).	(3.) Area available for Grain (80 per cent. of column 2)	(4.) Average Yield per Acre for last ten years (1904-5 to 1913-14).	(5.) Possible Annual Production of Grain on basis of average yield during past ten years.
	acres.	acres.	acres.	bushels.	bushels.
New South Wales ...	104,814,080	26,203,520	20,962,816	11·61	243,378,600
Victoria	47,754,240	11,938,560	9,550,848	11·55	110,312,000
South Australia ..	30,067,200	7,516,800	6,013,440	10·19	61,277,000
West Australia ...	59,840,000	14,960,000	11,968,000	10·77	128,895,000
Total for four principal wheat States ...	242,475,520	60,618,880	48,495,104	11·21	543,862,000

The next table gives the area under crop for grain and the production for all the States for the year 1913-14:—

WHEAT PRODUCTION IN COMMONWEALTH, 1913-14.

State.	Area.	Yield.	Average Yield per Acre.
	acres.	bushels.	bushels.
New South Wales (including Federal Territory).	3,205,397	38,020,381	11·86
Victoria	2,565,861	32,936,245	12·84
Queensland	132,655	1,769,432	13·34
South Australia	2,267,851	16,936,988	7·47
West Australia	1,104,753	13,496,242	12·22
Tasmania	18,432	349,736	18·97
Total	9,294,949	103,509,024	11·13

The possible extension of the area under wheat, and the increase of production from the present 103,500,000 bushels for the Commonwealth to about 540,000,000 bushels for the four principal wheat States will be found to be a low estimate when the data on which it is based are examined more closely.

The assumptions are:—

1. That wheat cannot be grown profitably with less than 10 inches of rain during the period of growth.
2. That the proportion of land suitable to, or available for, wheat production is about one-quarter of the total area within this isohyet.
3. That the average yields per acre for the past six years will be maintained.
4. That only four States take part in this expansion.

With regard to (1), it may quite reasonably be expected that improved methods of cultivation and improvements in drought-resisting wheats may make it possible to extend the area of profitable wheat-growing into even drier districts than are now considered safe. In addition there is the possibility of growing wheat in the dry areas under irrigation, a subject that is now being pushed forward energetically in all the States.

A very considerable change has taken place within the last few years in our ideas as to what constitutes a safe rainfall for wheat-growing.

In 1904 the late Government Statistician for New South Wales (Sir T. A. Coghlan, now Agent-General for New South Wales in London) placed on the map a "Wheat experience line," which defined the extreme western boundary of profitable wheat-growing at the time. Since that time, however, the causes mentioned above—improved methods of cultivation and improved wheats—have caused this line to be extended westwards to such an extent that the present Government Statistician (Mr. J. B. Trivett) has been able to put a new wheat experience line on a map issued by him in 1912, showing the inclusion of an additional 13,500,000 acres on which wheat is being profitably cultivated.

With regard to (2), the proportion of suitable land, I can only find that this has been estimated with any accuracy in the case of New South Wales. This estimate leaves out of account all the coastal districts and the northern districts, where wheat is now grown only for hay. It also excludes the mountainous country and all country which under present conditions is unsuited to wheat.

The late Director of Agriculture for Victoria (Professor Cherry) estimated the area available for wheat production in that State at 28,000,000 acres. If this estimate is correct the total production of wheat in Victoria would be capable of being increased to 323,500,000 bushels, and that for the four States to nearly 757,000,000 bushels. The estimate appears, however, to be high, as it assumes that considerably more than half the area receiving 10 inches of rain from April to October is both suitable and available for wheat-growing.

(3) The average yields per acre for the separate States has been maintained fairly at this level for the past ten or eleven years. We experienced one exceptionally droughty season as late as 1902, when the yield per acre for the Commonwealth was only 2·4 bushels, but the succeeding harvest yielded an average of 13·32 bushels. Last harvest (1913-14) yielded an average of 11·13 bushels. The season just passed has proved one of the most disastrous experienced, and the yield per acre in New South Wales for the present harvest is not likely to be more than 6½ bushels on the area actually reaped. This will of course temporarily reduce the average yield per acre.

(4) No account is taken of expansion in other States than the four present wheat States. Tasmania is not likely ever to develop to any extent as a wheat-producing country—the area under wheat is actually diminishing—but on the other hand, Queensland has enormous areas suitable for wheat production, which will undoubtedly be cultivated as the country develops

The Northern Territory is another unknown quantity. Wheat, in common with other crops, has only been experimentally tried in the Territory, and the Commonwealth Year Book gives the area under cultivation as 20 acres. From the reports of those who have been there, there is no doubt that there is an enormous area, both within and outside the Tropics, where climate and soil are quite suitable for wheat-growing, and we are justified in looking forward to a very considerable addition to our wheat-growing area when the Territory becomes developed.

Taking all these points into consideration, I feel convinced that the estimate given is a low one, and may be regarded as a quite legitimate forecast of the expansion to be expected under present conditions, and at the present rate of development of the industry.

Purely economic considerations have not been taken into account in the foregoing discusssion. The continually increased cost of farm operations and labour troubles in connection with sowing, harvesting, &c., have to be reckoned with; further, the present want of railway facilities and the absence of bulk handling are factors which will be particularly discouraging when the question of developing such large areas arises. Bulk handling is a subject that is being much discussed at present, and it would seem to be fairly certain that some system will come into operation within the next few years.

Even with the present expansion the railway authorities find great difficulty in handling the harvest, and some improvement on the present system becomes more and more imperative every year.

Sorghum Poisoning.

A correspondent referred to the recent advice in the *Gazette* to plant Sorghum Saccharatum and Early Amber Cane, and asked whether there was any danger to stock in feeding these owing to the presence of hydrocyanic acid in poisonous quantities, and whether it was safe for stock to be given sorghum when it was, say, a foot high, if allowed to wilt for twenty-four hours first.

In reply, the Chief Inspector of Agriculture stated that both Sorghum Saccharatum and Early Amber Cane can be fed to stock without any danger of poisoning when the plant has reached the flowering stage. If it is intended, however, to feed it before it has reached such a stage of growth, it is necessary that the cut green feed should be allowed to wilt for, say, at least twelve hours. If, as the correspondent suggested, it was allowed to wilt for twenty-four hours, all danger of poisoning would be obviated.

A Shearing Shed for Small Flocks.

J. WRENFORD MATHEWS.

ONE of the chief requirements of many of the small flock-owners of to-day is a suitable shed in which to have their sheep shorn. While some have gone carefully into this matter, others have never thought it worthy of consideration. The splendid accommodation provided by many small breeders for the shearing of their flocks and the treatment of their clips reflects much credit on those concerned. Such accommodation is strikingly in contrast with the dirty and slovenly conditions under which some are content to have their sheep shorn. Very often a badly-lighted, poorly-ventilated, tumble-down old structure, in no way conducive to the health of those carrying out the work or of the sheep that are being shorn, is used for the purpose. As is frequently the case, a stable, barn, or some other outbuilding is utilised. The sheep are shorn amidst an accumulation of straw, fragments of twine, and other matter, which has a deleterious effect upon the wool.

It has been asserted that because a shearing shed is used only once a year the outlay on a permanent structure is not warranted. Where small flocks of sheep are to be dealt with this certainly furnishes food for reflection, especially if the building in question cannot be used for any other purpose. It is calculated, however, that it would be only a matter of time before the expenditure involved in erecting a permanent structure would be amply repaid by the increased facilities afforded by it. The provision of a proper shed incurs less liability of the sheep becoming knocked about at the time of shearing; this operation is also rendered more congenial, and enables the wool to be handled more expeditiously.

What is required to meet the case is some method of construction, simple in design and efficient in all departments, yet inexpensive. If the shed can be so planned as to enable it to be used for some other purpose when not required for shearing, so much the better, and so much greater will be the inducement to have a permanent building erected. This, however, is rather a difficult matter. It so happens that when the shed might serve for another purpose it is required for shearing. Wool, too, like many other products, always requires to be handled by itself. Because of the necessity for keeping wool from coming in contact with foreign bodies shearing sheds are generally made a separate structure.

In addition to the plans which have previously been submitted* there is one, somewhat novel in design, which can be utilised for a dual purpose.

* "A small Shearing Shed." H. S. Major, *Agricultural Gazette*, October, 1912. "The Shearing Shed at Bathurst Experiment Farm." R. W. Peacock, December, 1913.

Of course, the site on which the shed is to be erected will always largely determine the mode of construction. The structure in question can serve as a shearing shed, and may also be made use of for the storage of grain. The portions that may be utilised for the latter purpose are represented in the sections occupied by the sweating pens. The shed is built on the ground level; it is preferable to an elevated structure, which would necessitate the forcing of the sheep up a ramp to the higher level and the arrangement of chutes underneath. The battens are made portable, and are so constructed as to enable them to be conveniently removed in sections. Instead of the ordinary ground surface, the inside allotted to the sweating and catching pens is of brick and concrete formation, upon which rests the batten sections. The brick floor, as the plan shows, is about 6 inches below that forming the level of the shearing board. The section on which it stands being movable, at the completion of shearing the whole floor can be elevated and the droppings cleaned out, thus leaving a perfectly clean bottom available for the storage of grain, &c., as indicated. At the Agricultural College, for which this shed was designed, the floor in question was used for the pickling of grain. The whole structure, with the exception of the engine shed, is built under the one roof. As a study of the plans will show, in proportion to the total size of the shed the fullest amount of space is provided for the housing of the sheep, and ample space has been allowed for the treatment, pressing, and storing of the wool. The space allotted in the plans for the shearing board is rather more than is ordinarily required. As has already been pointed out, the shed in question was designed for an Agricultural College, where students could undertake shearing with either blades or machines. For ordinary requirements an 8-foot space of board would be quite sufficient.

The walls towards the top are made to open up by means of large shutters which can be raised or lowered, thereby affording plenty of ventilation. The shed is lighted from the roof as well as from both ends, thus ensuring an equal distribution throughout. The building referred to was constructed of galvanized iron, but other materials would be suitable for the purpose. The dimensions given would provide accommodation for the shearing of 6,000 sheep, but as the plans are drawn to scale they could be so altered as to enable the building to be constructed to any size desired.

ILLUSTRATIONS.

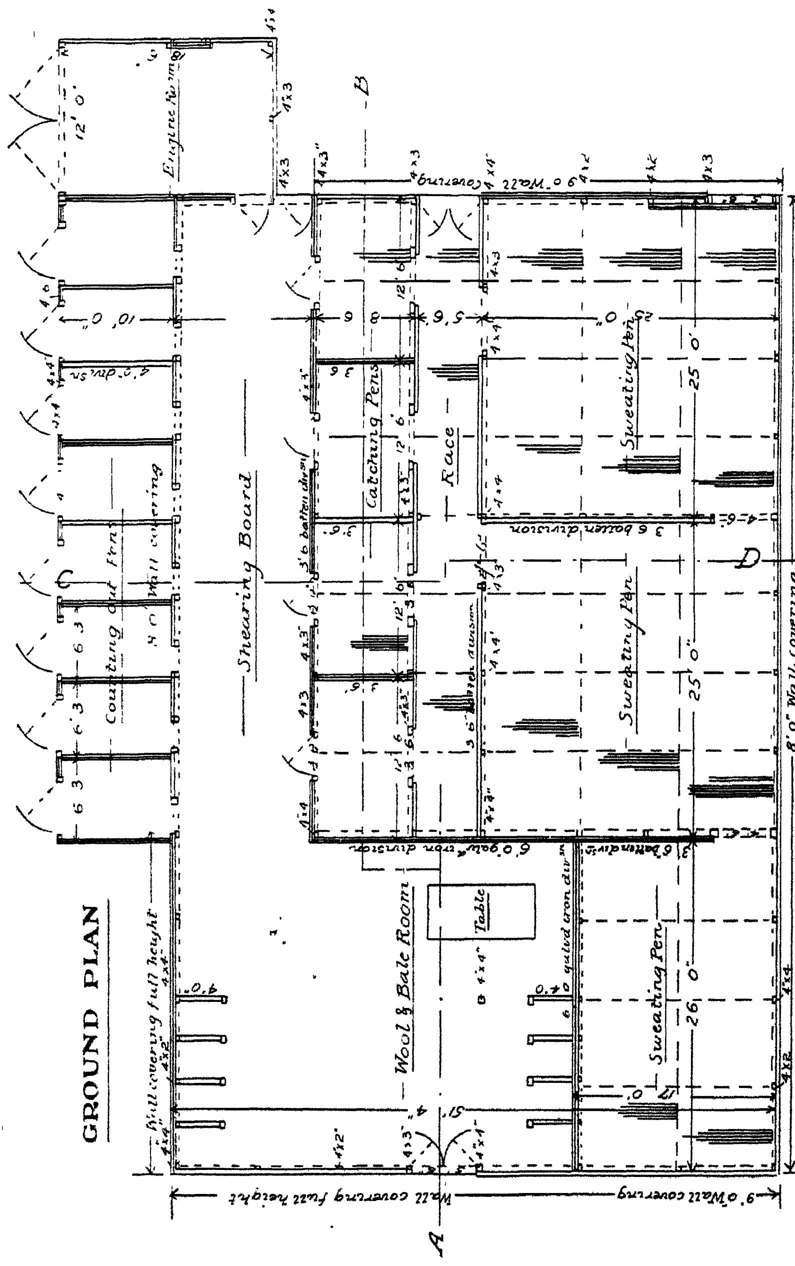
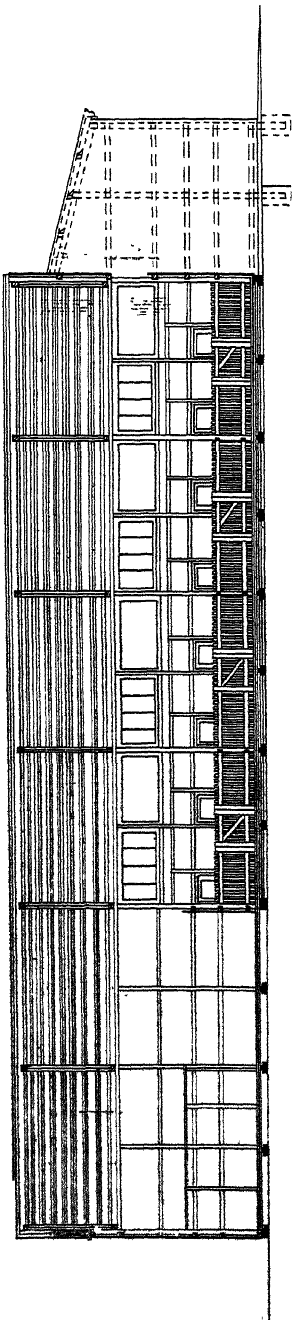
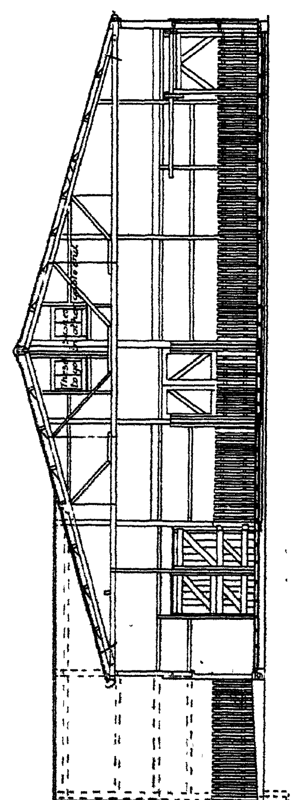


Fig. 1.—Ground plan of Shearing Shed.



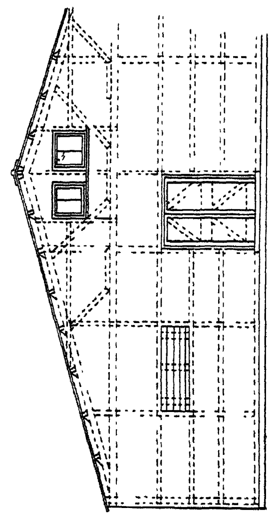
SECTION A·B

Fig. 2.—Section through A—B as marked in Fig. 1.



SECTION C.D.

Fig. 3.—Section through C—D as marked in Fig. 1.



PART END ELEVATION

Fig 4.—Showing framing of end.

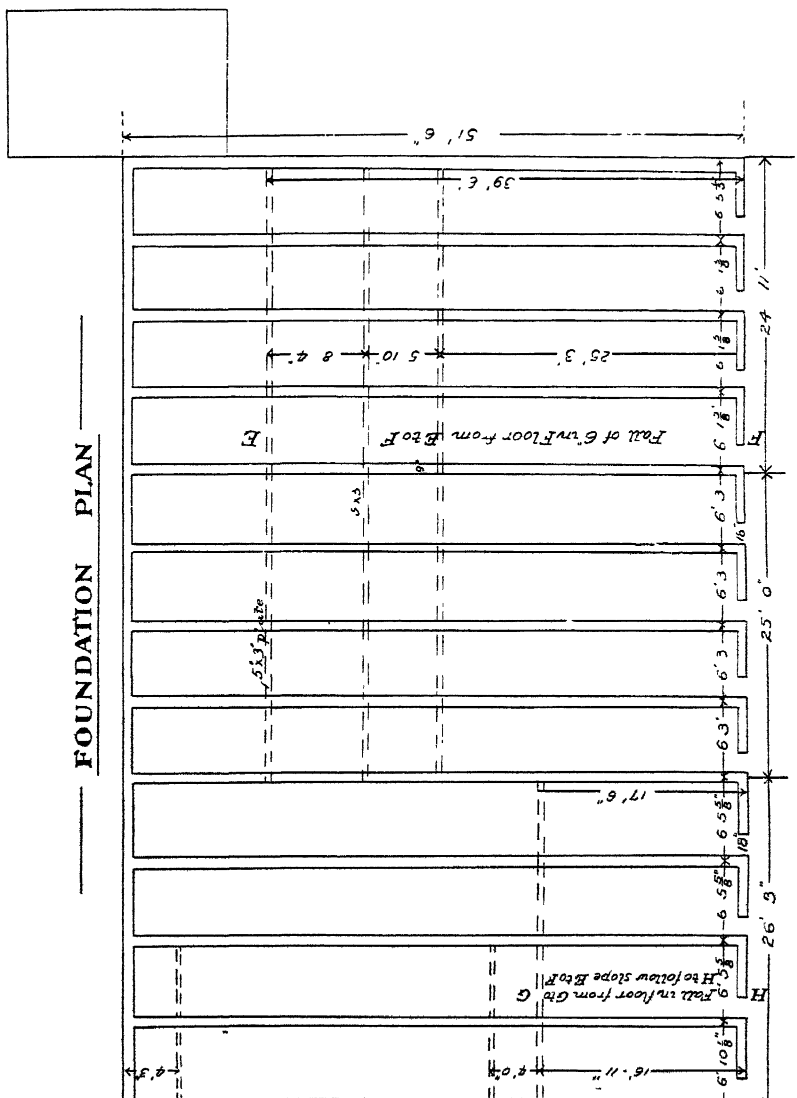


Fig. 5.—Showing foundation plan.

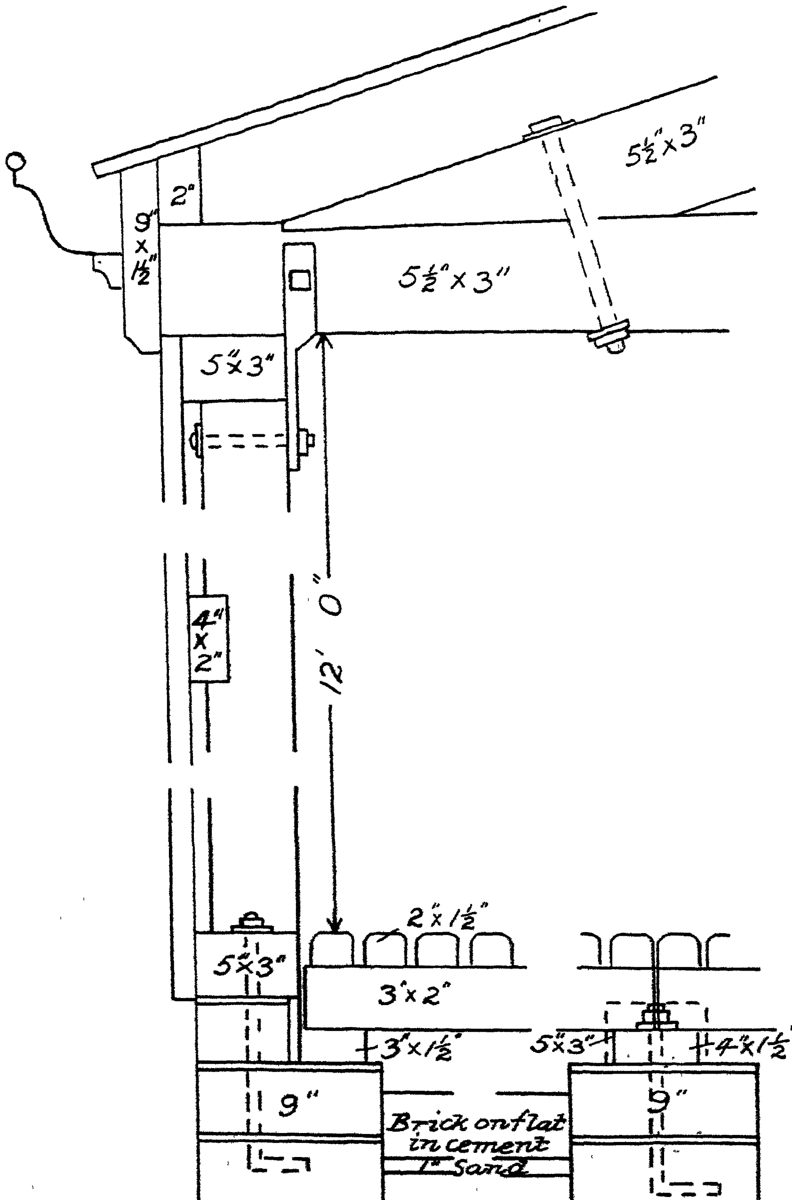


Fig. 6.—Showing details of wall and floor construction.

Winter Green-fodder Competition, 1914.

DAPTO AGRICULTURAL AND PASTORAL ASSOCIATION.

[In the past few years the Dapto Agricultural and Pastoral Association has conducted a competition that has done much to bring into prominence the value of growing green fodder on the South Coast and in contiguous districts. The method adopted has been to offer a substantial prize for the best growing crop, to be judged in the field. To ensure that the fodder shall be available at the time when it is required, the conditions provide that no competing crop shall be judged after the 31st August, unless, the season being a late one, it is decided to postpone the final date for judging; in no case, however, is it permissible to exhibit such a crop as late as October. The area offered for adjudication must be one acre, and judging is done according to a scale of points previously agreed to. With the approval of the Minister, Mr. H. Ross, Chief Inspector, acted as judge in 1914, and the following report which he furnished to the Society in making the awards is published for general information.—ED.]

TEN entries were received, and judging commenced in August and lasted until about the middle of September.

The following is the scale of points upon which the awards were based:—

1. Suitability for green feed for dairy cattle	15
2. Condition of crop	15
3. Percentage of leafiness	15
4. Freedom from disease	15
5. Freedom from weeds	15
6. General appearance	10
7. Period of maturity	15
8. Yield, two points for every ton of green fodder.	

1. In a fodder crop for dairy cattle, quality, earliness, and disease-resistant properties must be taken into consideration. Regarding quality, for instance, a crop consisting of wheat and peas will gain a larger number of points than a crop of wheat only.

2. The greatest amount of nutriment is in the plant at the time when the grain is changing from the milky to the doughy stage, and in this respect will the condition of the crop have to be judged.

3. The percentage of leafiness is a most important point, as a fodder crop should be leafy and succulent.

4. This refers to freedom from rust, smut, mildew, and similar fungoid diseases, also insect pests.

5. This indicates the thoroughness of the preparation of the seed-bed.

6. This refers to evenness of crop, colour, &c.

7. The time occupied in growth of the crop.

8. Yield per acre to be taken by cutting out a section agreed upon between exhibitor and judge, say 12 feet by 12 feet; this crop to be weighed and averaged.

The Crops Grown.

The outstanding features of this year's competition were the excellent crops exhibited, and the fact that several farmers exhibited crops of wheat mixed with legumes, such as wheat and tares, speaks well for the progressive policy adopted in the district. The adoption of such a practice must have a far-reaching, beneficial effect upon the dairying industry, for while it is admitted that wheat, oats, or barley all have their proper uses and are almost indispensable to the dairy-farmer, it must not be forgotten that by themselves they do not form a balanced ration. With the addition of a legume, however, such as peas or tares, the ration assumes a far higher value, for it then contains more of the elements essential for milk and butter-fat production.

Messrs. Lindsay, Harris, and Waples apparently see the advantages accruing from these balanced rations, since the crops they exhibited were wheat and peas, and wheat and tares.

This practice of providing green winter feed cannot be too highly recommended, and a few remarks concerning the cultivation and sowing methods in connection therewith will be made further on.

The two crops exhibited by Mr. Lindsay were of exceptional value, and it would be hard indeed to see better crops on the Coast than those exhibited by this gentleman. They were sown with a drill and manured, and this no doubt had not only the effect of increasing the yield to such splendid proportions, but also of adding to the general appearance, &c.

Mr. J. McPhail exhibited a crop which, although in yield next to Mr. Lindsay's crop, yet could get no nearer than eighth in position; this was mostly due to the fact that the crop at the time of my inspection was not out in ear, and on that score Mr. McPhail lost several points, as regards both condition of crop and general appearance.

Mr. Harris' crop would have come nearer the winning mark had the wheat come out better than it did, but for some reason or other the germination, although the seed was sown thick enough, was not satisfactory.

Wheat *v.* Oats and Barley as Fodder for Dairy Cattle.

A few remarks concerning the relative value of wheat, oats, and barley for dairy cattle may not be out of place here.

A diversity of opinion appears to exist, and while some farmers contend that the cows milk better on wheat, others again pin their faith to oats, while barley is not without its champions.

The value of a fodder for dairy purposes, be it winter or summer fodder, is determined by its milk and butter-fat producing properties, and these in their turn are determined by analysis and practical tests.

Analyses disclose that green wheat, green oats, and green barley contain approximately the same amount of carbo-hydrates and protein. Thus it will be easily seen that not much difference exists between them. Practical tests also point to the fact that cows milk equally as well on wheat as they do on oats and barley. I can quite believe that a good few thoroughly practical

and up-to-date dairymen in the district will shake their heads at this statement, and contend that the flow of milk when feeding oats has always been greater than when feeding wheat. With that contention I quite agree, but under conditions that produce a somewhat different conclusion.

The earliest fodder fed by farmers on the South Coast to their cattle is wheat, say in July and middle of August. The cattle up to then have had to rely on natural pastures, which, in the majority of cases, have been scanty, but with a fairly plentiful supply of green wheat the milk yield steadily increases. As time advances towards the end of August the natural herbage increases in bulk and quality, and naturally the cows are getting into good condition and the flow of milk is good. It is at this time that oats are about fit to cut, and the dairyman begins to feed them, to find that the flow of milk is still increasing and is greater than when he was feeding with wheat. At first sight it would appear that the oats have been responsible for the increasing yield of milk, but closer investigation suggests plainly that the oats, in conjunction with the improved herbage on the pastures, have only continued the flow of milk, the foundation of which had been laid by the early feeding of wheat in July.

Oats unquestionably in average seasons will return a heavier yield of green fodder than the varieties of wheat growing in the district, but there are varieties of wheat that will yield as large a bulk of fodder as oats. Why, then, are not these varieties grown on the Coast? The reply brings us to the crux of the whole question—they are too late. Varieties such as Cleveland, Yandilla King, and Marshall's No. 3, on account of their late maturing qualities would not withstand the ravages of rust. It is on account of this, and because green feed is urgently needed in July and August, that it is not only advisable but absolutely imperative that farmers on the Coast should make sowings of early maturing varieties of wheat, to be followed by barley and oats.

Varieties Reviewed.

All the wheat crops exhibited were either Thew or Huguenot.

While Thew is unquestionably the most suitable wheat for coastal conditions, its absence of flag and comparatively poor stooling qualities detract to a certain extent from its value; yet it must be remembered that all early maturing varieties of wheat have the same disadvantage from a green fodder point of view. Florence is proving an excellent wheat, and farmers would be well advised to give it a trial.

Huguenot is a wheat particularly suited to the district, especially when sown in conjunction with peas or tares, but it is rather late for general feed purposes. The crop of Huguenot exhibited by Mr. John McPhail was a particularly fine one, and, but for the fact that no legumes were sown with it and that it was not quite out in ear, it might have altered the awards.

Barley was exhibited by Mr. Musgrave. This crop should have had a legume sown with it, either peas or tares.

Oats were not exhibited by any of the competitors, which is most likely due to the fact that the oats would have been too late for competition.

However, the growing of oats as a late green winter fodder is to be strongly advocated for the district, in order that green fodder may be available when the wheat and barley paddocks have been cut out. One of the best varieties of oats yet grown on the Coast is Ruakura, and I would strongly advise farmers to give it a trial.

Sowing the Crop.

Most of the crops inspected were broadcasted at the time of sowing, only a few of the exhibitors having drilled their crops in.

It is hardly necessary to point out to those who have had no experience with a drill the advantages accruing from that implement; not only can considerably less seed be sown per acre if it is drilled in than if it is broadcasted, but the use of artificial manures is almost useless without it.

The crop exhibited by Mr. Lindsay had 1 bushel of Thew drilled in with half a bushel of peas and 1 cwt. of superphosphate. The majority of competitors used 2 bushels of seed per acre, and then it appeared to be none too thick. The use of the drill simply means that instead of sowing 2 bushels per acre, as has been the practice in the past, 1 bushel is quite sufficient. In fact, 1 bushel of seed drilled in will give better returns than 2 bushels broadcasted.

Presuming that a farmer on the South Coast sows annually 15 acres of green fodder and pays 7s. per bushel for his seed, it will be seen that he has to expend £10 10s. on seed if he broadcasts it, and £5 5s. for seed if he drills it in.

I do not wish to suggest that every farmer in the district should buy a drill, as possibly he would not find sufficient use for it, but the example set by some of the members of the committee in purchasing a drill on the co-operative principle is a practice that is to be highly commended, and that should be followed by every farmer who has need to sow part of his area for green winter fodders.

The following are the awards made by me in order of merit:—

Name.	Suitability for Green Feed.	Condition of Crop.	Percentage of Leafiness.	Freedom from Disease.	Freedom from Weeds.	General Appearance.	Period of Maturing.	Yield.	Total points.	Actual Yield.	
										tons	cwt.
G. Lindsay	14	13	12	13	13	9	15	26·1	115·1	13	1
G. Lindsay	13	14	12	13	13	9	15	25·9	114·9	12	19
J. Waples	14	13	14	13	12	8	15	19·8	108·8	9	18
W. Harris	14	13	13	13	13	9	15	15·9	105·9	7	19
W. Harris	14	13	13	13	13	9	15	14·7	104·7	7	7
J. Waples ...	13	13	12	13	12	9	15	17·4	104·4	8	12
E. Hamilton	12	13	12	13	13	9	15	17·4	104·4	8	14
J. McPhail	13	11	13	11	12	8	15	20·7	103·7	10	7
— Brown	12	13	12	13	11	9	15	18·2	103·2	9	2
P. Musgrave	12	12	12	11	12	8	15	19·5	101·5	9	15

Hay and Winter Fodder Experiments, 1914.

GRAFTON EXPERIMENT FARM.

W. D. KERLE, Experimentalist.

The Experiments Supervision Committee, under whose control these experiments are being conducted, wish to draw the attention of farmers to the fact that final conclusions cannot yet be drawn from these trials, as they have only been conducted for one year. Later, when results for, say, five years are available, a summary will be prepared, as sufficient evidence should then be available to enable conclusions to be formed. Meanwhile it is felt that the public are entitled to know the results obtained each year.

WHEAT VARIETY TRIAL.

THIS experiment was designed to determine the most suitable varieties of wheat to grow for quality and yield of hay in this district, using those varieties known to be fairly rust-resistant.

Varieties.

The varieties under trial were—Thew (used in the "check plots"), Warren, Firbank, Florence, and John Brown.

The Soil and its Preparation.

This experiment was sown on land of a somewhat sandy nature, greyish in colour, and with a rather sharp slope to the south. It carried its first crop in 1913, having been put down to wheat in May of that year. The stubble of this crop was turned under in December. The second ploughing was given during the week ending 23rd May. After each ploughing the harrows followed immediately.

The Sowing.

The experiment was sown with the wheat drill on 28th May, 1914, the harrows following the drill.

The rate of seeding for all varieties was 49 lb. per acre. No artificial manure was used in this experiment.

The Plots.

The plots were 4·50 chains long and 23 links wide (two widths of the wheat drill); a space of 14 inches separated adjacent plots. Buffer plots of one drill width were sown on each side.

The Season.

The rainfall recorded from sowing to harvest was distributed as follows:—

June	4·50 inches.
July	3·22 "
August	·74 "
September	·80 "
Total	9·26 inches.

The season was a fairly favourable one for the growth of wheat. The month of August was exceedingly dry, which severely checked the growth and reduced the yields considerably. The September falls, although light, came at the critical stage, and gave a marked impetus to the growth. Under the circumstances, the yields obtained may be considered satisfactory.

Notes on Growth.

The germination throughout was highly satisfactory. The plants stooled out well, and very little dead flag was present.

Harvesting.

On 17th September a distance of 7 links was cut off each end of each plot, and discarded for comparative purposes. This left plots of one-tenth acre (4·35 chains x 23 links), which were cut with the reaper and binder when the grain was half formed.

The yields of hay obtained are as follow:—

WHEAT VARIETY TRIAL, 1914.

No. of Plot.	Variety.	Yield per $\frac{1}{10}$th Acre.	Yield per Acre.				Percentage Yield.
		lb	t.	c.	q.	lb.	
1 (*check*) ...	Thew	513	2	5	3	6	100·00
2	Firbank	479	2	2	3	2	89·87
3	Warren	491	2	3	3	10	88·78
4 (*check*) ..	Thew	573	2	11	0	18	100·00
5	Florence	554	2	9	1	24	102·02
6	John Brown . ..	463	2	1	1	10	90·25
7 (*check*) ...	Thew	483	2	3	0	14	100·00

Maturity.

The varieties matured in the following order:—

Firbank, harvested 15th September.
Florence, „ 17th „
Thew, „ 24th „
Warren, „ 1st October.
John Brown, „ 8th „

Rust-resistance.

The growth of rust was not excessive in any variety. Only spring rust (*Puccinia rubigo-vera*) was present, and resistance to it places the varieties under trial as follows:—

1. Thew.
2. Warren.
3. Florence.
4. Firbank.
5. John Brown.

The last-named variety was 50 per cent. worse than any other variety.

Comments.

All the wheats under trial, with the exception of John Brown, can be safely recommended for hay in this district. The earlier a wheat matures the better chance it has of escaping rust. None of the varieties under trial have

much leaf, but under the conditions obtaining here this is rather an advantage than otherwise. Scanty leaf facilitates drying, and as all varieties are rust-liable, the leaves are usually rendered useless, and only spoil the sample of chaff.

Wheat for hay on the poorer soils of this district is a very paying proposition, and is not practised to the extent it deserves, although the local market is a good one.

WINTER FODDER.—EXPERIMENT No. 1.—CEREALS.

Object.

To determine the most suitable cereal to grow for winter fodder in this district.

Soil, and its Preparation.

The soil throughout the paddock where this trial was made is of a sandy nature, greyish in colour, and too poor for satisfactory yields of maize or potatoes. The land has rather an abrupt slope to the south. In 1913 a crop of wheat was harvested off this paddock. It received two ploughings, one in December, and the second just previous to sowing. It was harrowed after each ploughing.

The Cereals Used.

The cereals under trial were as follows:—Thew ("check"), Warren, Huguenot, Algerian oats, Black Winter rye, Cape barley, and Skinless barley.

Sowing.

On 29th May this experiment was sown with the wheat drill. Light harrows followed the drill to ensure covering of the seed. No fertilisers were employed in this experiment.

Rate of Seeding.

Wheat	49 lb. per acre.
Rye	58 "
Oats	58 "
Skinless Barley	68 "
Cape Barley	68 "

Plot Dimensions.

Each plot was 4·5 chains long and 7 feet 7 inches (drill width) wide. Fourteen inches divided adjoining plots. The buffer plots of same dimensions were sown with Thew wheat on each side of experiment.

The Season.

The rainfall recorded from sowing to harvest was:—

June	4·50 inches.
July	3·22 "
August	·74 "
September	·80 "
Total...	9·26 inches.

The season was, for the most part, favourable to the growth of cereals, except for dry conditions which obtained in August. September rains, although light, greatly benefited the crop when coming into ear.

Notes of Growth.

The germination throughout was very satisfactory. Very little rust was present in the wheats, oats, rye, or Cape barley, but Skinless barley was rather badly attacked.

Harvesting.

A length of 7 links was cut off each end of each plot and discarded. The remainder, one-twentieth acre per plot, was cut with the reaper and binder, and weighed immediately after cutting. They were cut at approximately the same stage of maturity, *i.e.*, just as the flower had fallen.

The results of the weighing and yields per acre are as follow :—

No. of Plot.	Cereal.		Yield per Plot—1-20th acre.	Yield per Acre.				Percentage Yields.
			lb.	t.	c.	q.	lb.	
1	Thew	(*check*)...	430	3	16	3	4	100·0
2	Warren	... ..	420	3	15	0	0	99·4
3	Huguenot	... ...	336	3	0	0	0	80·9
4	Thew	(*check*) ..	408	3	12	3	12	100·0
5	Algerian oats ...	... ...	423	3	15	2	4	101·2
6	Black Winter rye..	... ..	564	5	0	2	24	131·7
7	Thew	(*check*)...	438	3	18	0	24	100·0
8	Cape barley ...	... ...	435	3	17	2	20	105·1
9	Skinless barley ...	.. ...	295	2	12	2	20	75·4
10	Thew	(*check*)...	368	3	5	2	24	100·0

WINTER FODDER.—EXPERIMENT No. 2.—CEREALS AND GREY FIELD PEAS.

Object.

To determine the highest yielding combination of cereal and field peas to grow for green-fodder.

Details of Experiment.

The details of this experiment are similar to those of Experiment No. 1, and it was sown adjacent to it, a buffer plot separating the two check plots.

The Grey Field peas were broadcasted over the plots by hand, at the rate of 40 lb. per acre, and harrowed in on 1st July.

The germination of the cereals was excellent, but the peas did not come up well. The subsequent growth of the latter was poor, and they were not more than 2 feet high when cut.

When the cereal was fit to cut, one-twentieth acre of each plot was harvested and weighed immediately.

Results.

The results obtained and the computed yields per acre were as follow :—

No. of Plot.	Cereal and Peas.	Yield per 1-20th Acre.	Yield per Acre.				Percentage Yields.
		lb.	t.	c.	q.	lb.	
1	Thew and peas ... (*check*)...	337	3	0	0	20	100·0
2	Warren and peas	396	3	10	2	24	113·6
3	Huguenot and peas	402	3	11	3	4	111·6
4	Thew and peas .. (*check*)...	372	3	6	1	20	100·0
5	Algerian oats and peas	399	3	11	1	0	110·6
6	Rye and peas	450	4	0	1	12	128·8
7	Thew and peas ... (*check*)...	338	3	0	1	12	100·0
8	Cape barley and peas	396	3	10	2	24	110·6
9	Skinless barley and peas... ...	295	2	12	2	20	80·0
10	Thew and peas ... (*check*)...	384	3	8	2	8	100·0

WINTER FODDER.—EXPERIMENT No. 3.—CEREALS AND BLACK VETCHES.

Object.

To determine the highest-yielding combination of cereal with vetches to grow for green feed.

Details of Experiment.

The details of this experiment were uniform with those of Experiment No. 1, except that Black vetches were sown broadcast at the rate of half-bushel per acre on 1st July and covered with the harrow. The sowing of the cereals was made on the 30th May.

The germination of the cereals and vetches was satisfactory throughout. The growth of vetches was not luxuriant, but they were considerably better than the peas in Experiment No. 2.

Results.

The harvesting of one-twentieth acre per plot was done at approximately the same stage of maturity, and the results obtained were as follow :—

No. of Plot.	Cereal and Black Vetches.	Yield per $\frac{1}{20}$th Acre.	Yield per Acre.				Percentage Yields.
		lb.	t.	c.	q.	lb.	
1	Thew and vetches (*check*)...	345	3	1	2	12	100·0
2	Warren and vetches	399	3	11	1	0	111·5
3	Huguenot and vetches	363	3	4	3	8	98·0
4	Thew and vetches (*check*)...	383	3	8	1	16	100·0
5	Algerian oats and vetches ...	408	3	12	3	12	107·6
6	Black rye and vetches	531	4	14	3	8	141·6
7	Thew and vetches (*check*)...	371	3	6	1	0	100·0
8	Cape barley and vetches... ...	423	3	15	2	4	113·5
9	Skinless barley and vetches ...	301	2	13	3	0	82·3
10	Thew and vetches (*check*)...	363	3	4	3	8	100·0

WINTER FODDER.—EXPERIMENT No. 4.—CEREALS AND RED CLOVER.

Object.

To ascertain the highest-yielding combination of wheat, oats, or rye with Red clover.

Details of Experiment.

The details of this experiment resemble those of Experiment No. 1, except that the cereals tried were only three in number, viz., (*a*) Thew wheat, (*b*) Algerian oats, and (*c*) Black Winter rye, and that sowing was carried out on 30th May.

The clover was broadcasted at the rate of 2 lb. per acre on 2nd July, and lightly harrowed in.

The cereals germinated very well, but the clover came up very thinly. It practically made no growth at all, and at harvesting was so short that the knife of the binder missed it.

The yields obtained were as follow:—

No. of Plot.	Cereals and Clover.	Yield per $\frac{1}{20}$th Acre.	Yield per Acre.				Percentage Yields.
		lb.	t.	c.	q.	lb.	
1	Thew and Red clover (*check*)...	353	3	3	0	4	100·0
2	Algerian oats and Red clover ...	402	3	11	3	4	115·4
3	Black Winter rye and Red clover	537	4	15	3	16	156·3
4	Thew and Red clover (*check*)...	339	3	0	2	4	100·0

Summary.

The average yields of the check plots were as follow:—

	tons	cwt.	qrs.	lb.
Experiment No. 1	3	13	1	16
" 2	3	3	3	15
" 3	3	5	1	2
" 4	3	1	3	4

This is indicative of the failure of peas and clover, and to a less extent of vetches, when sown with wheat this season. The poor growth of the legumes was due to want of rain in the early stages of growth.

Black Winter rye has given by far the heaviest yields of greenstuff per acre. It was 5 feet high, uniform, had no dead flags, and was free from rust. It also has the advantage of being an excellent grazing crop.

The other cereals, with the exception of Skinless barley, all yielded about the same quantity of green fodder per acre. Cape barley was, if anything, first; followed by Thew wheat, Algerian oats, Warren and Huguenot wheat.

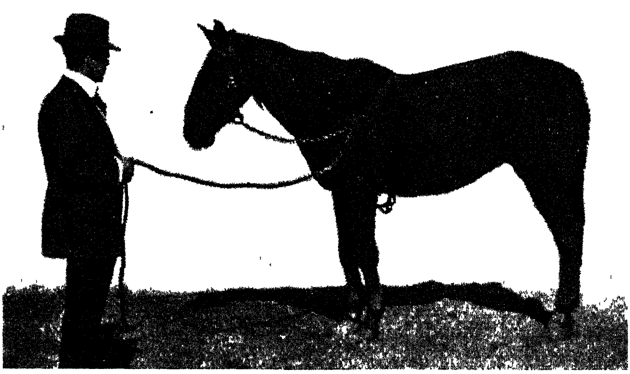
Skinless barley demonstrated its unsuitability for coastal conditions. It was very badly attacked by rust, and in a season when that disease was not much in evidence.

Red clover seems to be useless for inclusion with cereals in soiling crops. Berseem or Egyptian clover should, on the other hand, be excellent for the purpose. In future trials of winter fodders, this variety will be substituted for Red clover.

A Locking Apparatus for Throwing a Horse Single-handed.

C. J. WOOLLETT, Stock Inspector, Cobar.

THE necessity for some method of being able to throw a horse single-handed occasionally arises on a farm, and the writer has improved on a method which makes the handling of even a heavy draught a comparatively simple matter, and one which requires very little effort on the part of the operator. The apparatus can be easily made by any saddler and blacksmith for use on the farm, and the total cost should not exceed 30s.



The apparatus fixed before tying up off foreleg.

The outfit consists of a leather surcingle, locking apparatus, hobble strap and chain, leather headstall, 3 feet of 1-inch link chain, and 10 feet of ½-inch rope. The surcingle is 7½ feet long and 1½ inches wide. To make it sufficiently strong the leather should be double, and a sufficient number of holes should be punched in it so that it can be adjusted to horses of all sizes. The locking apparatus should be attached to the surcingle by a double fold of strong leather, and fastened with two or three rivets. If the leather is sewn on it will certainly tear off with the strain.

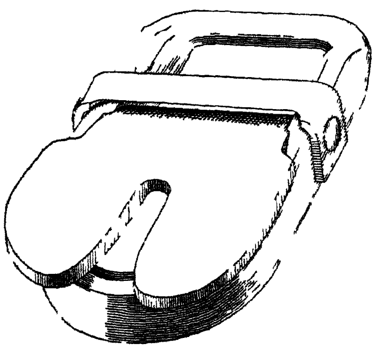
The whole apparatus is shown in position in the illustration, except that the off foreleg is not tied up. If the ground is at all hard something should be tied round the knee to prevent it being injured when the horse begins to struggle. He invariably comes down on the knee before he falls over.

When the horse's head is pulled round to the near side and kept turned so by the locking contrivance, and the off foreleg is tied up with the hobble-strap attached to the surcingle, the centre of gravity is changed, and after a

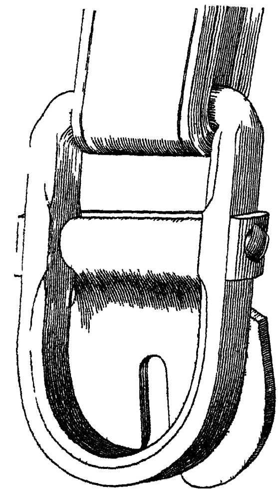
little struggling on the part of the horse, he rests with the off knee on the ground and then falls over.

When the horse is down it is an easy matter to tie him up as required.

The flap marked A will allow the chain to be pulled towards the operator, but immediately the horse attempts to straighten his neck the first cross link of the chain is caught in the V of the flap. This flap is only allowed to open to the extent of half an inch by the bar marked B.

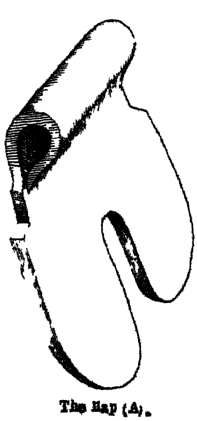


General view of Apparatus.

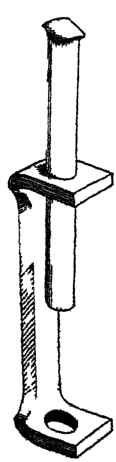


View from underneath, showing flap and bolt.

When everything is adjusted it is advisable to turn the horse's head round as far as possible. keeping the chain tight before standing back from him. He will generally jump about on the three legs for a little while, but the awkwardness of his position will soon bring him on his knee Rough



The flap (A).



The bar (B) and bolt

handling must be avoided. Gentle pulling on the chain-rope will cause him to fall over. A fractious horse, however, may have a struggle to get up again, and may even try two or three times, but the strain on his near foreleg is too much for him. He then tries to prop himself up with his nose on the ground. A gentle pull then is generally sufficient to bring him over.

With this method a horse rarely struggles when down, as he is too tired to struggle. When side-lines or hobbles are used to throw a horse, the operation being much quicker, the horse loses less of his strength. By these methods at least three strong men are required, whereas with the writer's simple contrivance all that is required is a cool head.

Recent Farmers' Bulletins.

THE Farmers' Bulletins issued by the Department of Agriculture are small text-books dealing with subjects of interest to farmers. Many are compilations from the *Agricultural Gazette*; others have been specially written for publication in this form. Any farmer can obtain copies post free by writing to the Under-Secretary, Department of Agriculture, Sydney.

The following are some of those more recently issued:—

16. Manures and Manuring; by F. B. Guthrie, Chemist.

This Bulletin is in its fourth edition, and is in constant demand. In quite popular terms it states the requirements of plant life, mentions the principal sources of each class of plant food, and indicates how they may be supplied.

17. Formulæ for Preparing Fertilisers; by F. B. Guthrie, Chemist.

This is the complement of the preceding Bulletin, suggesting the most suitable combinations of fertilisers for field, orchard, and garden crops.

37. Lucerne.

The largest Bulletin yet issued by the Department; now in its second edition. It describes the nature and habit of the plant, its cultivation and management under all conditions, and its diseases and pests.

58. Hides, Skins, and Sundries; by E. J. Shelton, Pig and Bacon Expert, Hawkesbury Agricultural College.

Deals fully with the best methods of preparing and packing hides, sheep and fur skins and station sundries.

63. Orchard Nursery Work: Budding and Grafting; by W. J. Allen.

Describes fully, with the aid of numerous illustrations, the various methods of carrying out these important operations, and names the best classes of stock for each variety of fruit. Though only recently issued, the first edition has been exhausted, and the second is now available.

64. Cauliflower and Cabbage Cultivation; by A. J. Pinn, Inspector of Agriculture.

Inasmuch as New South Wales annually imports something like 1,000 tons of these vegetables, the opportunity for profitable increase in production is obvious. This Bulletin describes the best methods and varieties, and is already in its second edition.

69. Explosives in Agriculture. Clearing; by George Marks, Inspector of Agriculture, North Coast. Sub-soiling; by H. C. Coggins, Assistant Inspector.

The value of explosives in agriculture is only coming to be recognised. This Bulletin is the result of a good deal of experiment, and describes the various methods in both classes of work.

73. Seeds and Seed Testing for Farmers; by C. T. Musson, Hawkesbury Agricultural College.

Good seed is of first importance to farmers, and how to test a parcel should be known to all. The saving of seed, factors that make for quality, protection of it from pests, and other aspects of the matter, are dealt with here.

75. The Potato; compiled by A. J. Pinn, Inspector of Agriculture.

This supersedes Bulletins No. 27, "The Potato," and No. 31, "Certain Fungoid Diseases of the Potato." Preparation of the soil, choice of seed, cultivation and harvesting of the crop and the various pests and diseases of the potato are fully dealt with.

78. Maize Culture; compiled by A. H. E. McDonald, Manager, Coonamble Experiment Farm.

In a series of chapters by various officers of the Department, the practical aspects of the production of maize are treated in a Bulletin of 88 pages.

79. The Manuring of Orchards; by W. J. Allen, Fruit Expert.

The question of manuring is of greatest importance to fruit-growers, and here suggestions for the requirements of different classes of fruit are presented, while a considerable section is devoted to cover crops.

86. Plum and Prune Culture; by W. J. Allen, Fruit Expert.

Prune growing is attracting increasing attention, and advice is here offered as to the best varieties, cultural treatment, pruning, and drying.

87. The Teeth of the Horse and its Age; compiled by the Veterinary Officers of the Stock Branch, under the authority of S. T. D. Symons, M.R.C.V.S., Chief Veterinary Officer.

By means of copious illustrations and explanatory matter, the Bulletin indicates the changes in the teeth of the horse at short intervals up to five years old, and at each year thereafter up to twelve years.

88. Fruit Preserving: Canning, Bottling, Jam Making, and Candying Peel; by W. J. Allen, Fruit Expert.

The sub-title indicates the scope of this Bulletin, which, however, includes recipes for other treatments of various fruits.

89. Egg-laying Tests at Hawkesbury Agricultural College: Twelfth Year's Results.

Contains the full results of the competitions held in 1913-14.

93. Sixth Annual Conference of Poultry Farmers: Hawkesbury Agricultural College, June, 1914.

Reports the transactions of the Conference of 20th June, 1914, and reproduces the two papers that were read on that occasion.

Ash Concrete for Use on the Farm.

[Continued from Vol. XXV, page 1056.]

A. BROOKS, Works Overseer, Department of Agriculture.

FIG. 5 shows the framing around a double fireplace in a cottage being erected, the openings having semi-arches over each, the boarding in the foreground being that for the hearth walls.

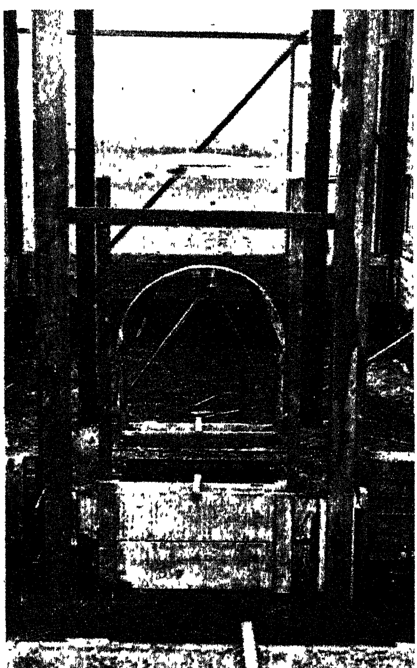


Fig. 5.—Framing over a double fireplace in cottage.

Fig. 6 shows a building which is a portion only of a cottage, being the back rooms, with the bathroom on the verandah, the intention being to add the remainder at a future date. The method of staying the studding and tying the framework together at the tops is clearly depicted, and the various lengths of the timbers show that they are those intended for other parts of the building when the walls are completed.

Fig. 7 shows a small dairy finished, giving a fair idea of the neat and solid appearance of these ash concrete buildings when completed. The

plastering is ruled out to represent stone blocks of 2 feet x 1 foot outside, but the inside is plain. The floor and the cream-can vat are of the same material, the sides of the latter being only 3 inches thick, but having a little extra cement in the mixture to make it hold water securely.

Specification for Mixing.

For foundations and other parts where greater strength is desired, to each five measures of ashes mix one of sharp sand and one of cement; for the first 3 feet of height in the walls over the floor-line use six parts of ashes, and for the remainder use seven parts of ashes, using the same quantity of sand and cement all through.

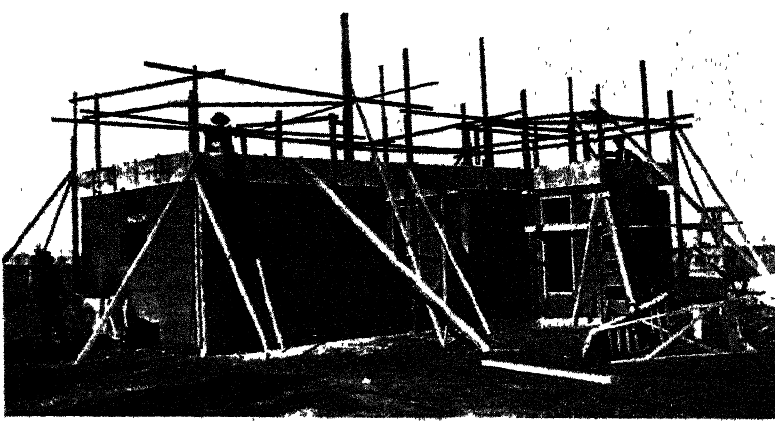


Fig. 6.—Portion of a cottage in course of erection.

Foundations.

The width of the trenches should be 5 inches wider than the thickness of the walls to be erected, and where the ground is solid, affording a good foundation, the depth need not be more than 6 inches, in which it is recommended that from 2 to 3 inches thick of sand be placed under the concrete. If, however, the ground is of an unreliable nature, and it is necessary to go deeper to get a solid bottom a thickness of 6 inches of sand should be put in. This should be evenly spread and wetted before the concrete is placed. To strengthen the foundation, at a distance of 3 inches from the bottom of the concrete place under the outer walls three rows and under inner walls two rows of ⅜-inch round iron rods well lapped and hooked at joinings, and turned at angles.

Walls.

The walls at the set-off for footings at the level of window-sills and at the heads of openings should have a continuous row of wire-netting binding, secured to frames where they cross.

Frames.

All door and window-frames should be secured with wire or hoop-iron ties, the ends being turned into the concrete. Ventilators for underfloors and ceilings are made of ¾-inch timber boxes, having wire-netting and gauze tacked on.

Sundries.

Where holes require to be provided for pipes, bolts, &c., in stone concrete buildings, it is necessary to make provision for these as the walls are erected, otherwise some hard cutting has to be done, but in ash concrete the cutting is an easy job, and a hole can be bored with a brace and drill.

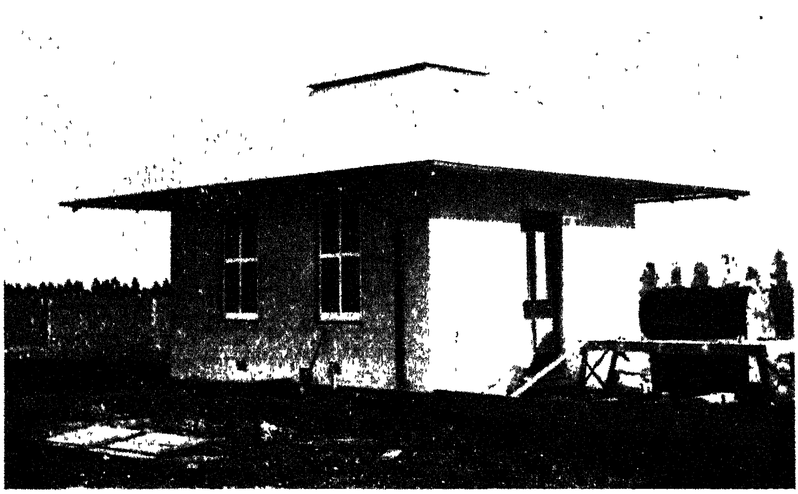


Fig. 7.—A small dairy built of ash concrete. Note the neat and solid appearance.

Plugging for nailing is also unnecessary, as the concrete holds nails well, and picture rails, architraves, skirtings, &c., can be nailed directly on to it. Fine nails should, however, be used.

Plastering.

For plain buildings, and especially if protected by a verandah, a good face can be put on with a mere skimming of cement mortar, rubbed on with a piece of bagging held tightly over a piece of board, similar to a plasterer's floating trowel. For better-class work a thicker coat is desirable, but not more than ⅜ inch thick anywhere.

Lime plastering may be applied to the inside where desired and finished with a coloured putty coat, as is usual in brick buildings. It is, however, desirable to use a little cement in the first coat of the plaster, which makes it withstand nails and knocks, without damage to the face of the walls.

Cost

The cost of materials varies considerably according to the locality, the distance they have to be conveyed, and so on. The ashes are usually obtainable at 2s. per ton, and if they are reasonably dry there should be about 45 cubic feet in each ton. Sand may be anything from 3s. to 15s. per cubic yard, and cement 5s. to 8s. 6d. per bag, if a full truck-load is taken; so that the cost of the materials would have to be worked out when it was ascertained how many cubic yards of concrete have to be used. Usually there are about 50 cubic yards in a cottage having four rooms and kitchen.

The cost of labour, including the making of the forms, the digging of the foundation trenches, and cleaning down on completion may be stated at 13s. per cubic yard, where the walls are not less than either 6 or 4 inches thick. When the walls are thicker the cost per cubic yard will be less, and if thinner, more than 13s. Plastering costs for bagging as described about 8d. per superficial yard, and if ⅜-inch thick 1s. 6d. for labour and materials. From the above figures it can be ascertained what the finished walls will cost.

The cost of similar work done on the Departmental Experiment Farms has been at least 2s. per square yard less than weatherboard buildings would cost, and the work has been quite satisfactory in other ways.

Remarks.

The uses to which this concrete may be put on the farm are almost unlimited once the farmer or his handy man has mastered the making of the forms and the mixing and placing of the material.

Feed and water troughs, either for fixed positions or portable, slabs for paving, fence and gate posts, steps for doorways, pipes for drains, and blocks for building may be made on wet days when other work cannot be done. The thing is to have the materials on hand ready for the wet days.

For most of the above items the concrete must be strengthened or reinforced, for which purpose old fencing wire or wire-netting may be used, placed near to the outer surfaces.

All finishing coating—that is, the plastering, should be put on while the concrete is green, but if it should be dry on the surface, wetting before plastering will assist the suction. The mixture for this finishing coat should usually be three parts sand to one of cement.

Making Wheat-bags Rat-proof.

With reference to the advice given on this subject in the December issue, Mr. Grahame Gow, of Nangar, Goolagong, writes that he has found the following plan simple and reliable in keeping mice from eating holes in wheat-bags:—

> Rub each bag all over with a few handfuls of sulphur. It does not take much for each bag, and the mice will never touch them. I tried this method, and they stood from stripping to sowing and there was not a hole in one of the bags. I suppose it would answer for rats, but I have had no experience with them.

The Birds Protected in New South Wales.

UNDER the provisions of the Birds Protection and the Native Animals Protection Acts the following birds are protected. The birds against the names of which an asterisk (*) is placed have been absolutely protected for the whole State until the 30th June, 1924, while the birds not so indicated are protected during the close seasons proclaimed in respect thereof

CLOSE SEASONS FOR BIRDS, SAVE QUAIL.

The close season for the undermentioned birds commences on the 1st day of July in each year, and terminates on the 31st day of January then next succeeding, viz.:—

- Wild ducks of every species, including Teal.
- Pigeons (except Wonga—which are absolutely protected—and the Top-knot or "Flock" Pigeon) and Doves of every species.
- Wild Geese of every description.
- Bitterns.
- Dotterel.
- Painted Snipe.
- Mallee Bird or Mallee Hen.
- Black Swan.

The close season for the Top-knot or "Flock" Pigeon commences on the 1st day of November in each year, and terminates on the 30th day of April then next succeeding.

The close season for all other protected birds (save Quail and those birds absolutely protected) is the period between every 1st day of August and the 31st day of January then next succeeding, both days inclusive.

The close season for Quail varies in different parts of the State and may be ascertained from the *Government Gazette* notice published half-yearly.

In order that readers may be able to identify the birds which have been referred to in previous issues of the *Agricultural Gazette*, the volume and page where the illustration or description has been given is appended.

FOREIGN BIRDS.

Common Name	Scientific Name.
*Skylark	Alauda arvensis.
Chaffinch	Fringilla cœlebs.
Goldfinch	Carduelis elegans.
Linnet	Linaria cannabina.
Thrush	Turdus musicus.
Blackbird	Turdus merula.
Nightingale	Sylvia luscinea.
Pheasant	Phasianus colchicus.
Grouse of every species	Tetrao and Lagopus.
Partridges of every species	Perdix.
White Swans	Cygnus.
Californian Quail	Callipepla californica.

AUSTRALIAN BIRDS.

Common Name.	Scientific Name.
Fish Hawks or Sea Eagles including the	Haliætus, Haliastur, and Pandion.
*White-bellied Sea Eagle	Haliætus leucogaster.
Native Companion	Grus australiensis.

* Absolutely protected.

AUSTRALIAN BIRDS—*continued.*

Common Name.	Scientific Name.	Vol.	Page
Emu	Dromaius novæ-hollandiæ.		
*Seagulls of every description.			
*Brush or Scrub Turkey	Talegallus lathami	XXV	792
*Bustard or Plain Turkey	Eupodotis australis.		
Mallee Hen	Lipoa ocellata	XXV	791
Bittern	Botaurus pœciloptilus.		
Little Mangrove Bittern	Butorides stagnatilis.		
Yellow-necked Mangrove Bittern ...	Dupetor gouldi.		
Minute Bittern	Ardetta pusilla.		
Land Rail	Hypotænidia phillipensis.		
Black Swan	Cygnus atratus.		
Wild Ducks of every species, including Teal.			
Plovers of every species, including the			
*Spur-winged Plover	Lobivanellus lobatus ...	XXV	970
*Black-breasted Plover	Sarciophorus tricolor.		
*Stone Plover, or "Thick-knee" (sometimes called "Land Curlew").	Œdicnemus grallarius ...	XXV	969
Pigeons and Doves of every species, including the			
*Wonga Pigeon	Leucosarcia picata.		
Wild Geese of every description.			
Painted Snipe	Rhynchæa australis.		
Black-fronted Dotterel	Ægialitis melanops		
Rufous-capped Dotterel	Ægialitis ruficapilla.		
Hooded Dotterel	Ægialitis cucullata.		
Dollar Bird	Eurystomus pacificus ...	XXII	316
Wood Swallow	Artamus	VII XXIII	383 234
Magpies (other than the Black Magpie) ...	Gymnorhina	XXII	948
*Peewit or Magpie Lark	Grallina australis (picata) ...	XXII	948
*Emu Wren	Stipiturus malachurus.		
Diamond Sparrow	Estrilda guttata.		
Indian Minah	Acridotheres tristis.		
Butcher Bird	Cracticus torquatus.		
Honeysucker	Meliornis.		
Mocking Bird	Anellobia mellivora.		
Swamp Pheasant			
King Parrots	Aprosmictus and Ptistes.		
*Ibis	Geronticus and Threskiornis.		
The bird commonly known as "The Happy Family," or "The Twelve Apostles."			
Quail of every species, including Turnix, Pedionomus, Coturnix, Synoïcus, and Excalfatoria.			
*Rifle Bird	Ptilorhis paradisea.		
*Regent Bower-bird	Sericulus melinus.		
*Grey Shrike-Thrush	Collyriocincla harmonica ...	VII XXII	383 316
*Rufous-breasted Shrike-Thrush ...	Collyriocincla rufigaster.		
*Black-faced Cuckoo-Shrike	Graucalus melanops.		
*Varied Cuckoo-Shrike	Graucalus mentalis.		
*Ground Cuckoo-Shrike	Pteropodocys phasianella.		
*Jardine's Caterpillar-eater	Edoliisoma tenuirostre.		
*White-eyebrowed Caterpillar-eater ...	Lalage leucomela.		
*White-shouldered Caterpillar-eater ...	Lalage tricolor	XXII	611
*White-shafted Fantail	Rhipidura albiscapa.		
*Rufous-fronted Fantail	Rhipidura rufifrons		
*Black and White Fantail (Wagtail) ...	Sauloprocta melaleuca ...	XXII	36
*Restless Flycatcher (Wagtail)	Sisura inquieta	XXII	36
*Lead-coloured Flycatcher	Myiagra rubecula.		

* Absolutely protected.

AUSTRALIAN BIRDS—*continued.*

Common Name.	Scientific Name.	Vol.	Page
*Shining Flycatcher	... Myiagra nitida.		
*Brown Flycatcher (Jacky Winter)	... Micræca fascinans	VII	395
		XXI	1026
*Black-faced Flycatcher	... Monarcha mellanopsis ...	VII	395
*Black-fronted Flycatcher ...	... Monarcha gouldi.		
*Rose-breasted Robin	... Erythrodryas rosea.		
*Scarlet-breasted Robin	... Petrœca leggii	XXI	668
*Flame-breasted Robin	... Petrœca phœnicea	XXI	668
*Red-capped Robin	... Petrœca goodenovii ...	XXI	400
*Hooded Robin	... Melanodryas bicolor ...	VII	397
		XXI	296
*Large-headed Robin	... Pœcilodryas capito.		
*Yellow-breasted Robin	... Eopsaltria australis... ...	VII	396
		XXI	298
*Golden-rumped Robin	... Eopsaltria chrysorrhous ...		
*Superb Warbler or "Blue Wren"	... Malurus australis	VIII	26
		XXI	778
*Black-backed Superb Warbler ...	... Malurus melanotus.		
*Turquoisine Superb Warbler ...	... Malurus callainus		
*White-winged Superb Warbler ...	... Malurus leucopterus.		
*White-backed Superb Warbler ...	... Malurus leuconotus.		
*Lambert's Superb Warbler ...	... Malurus lamberti.		
*Purple-backed Superb Warbler	... Malurus assimilis.		
*Scarlet-backed Superb Warbler	... Malurus melanocephalus ...	VIII	26
		XXI	779
*Yellow-breasted Thorn-bill ...	... Acanthiza nana	VIII	31
*Scrub Thorn-bill	... Acanthiza pusilla.		
*Rufous-rumped Thorn-bill ...	... Acanthiza pyrrhopygia.		
*Striped-crowned Thorn-bill ...	... Acanthiza lineata.		
*Chestnut-rumped Thorn-bill ...	... Acanthiza uropygialis.		
*Yellow-rumped Thorn-bill ...	... Geobasileus chrysorrhous	VIII	31
*Buff-rumped Thorn-bill	... Geobasileus reguloides.		
*Brown Singing Lark (Sky-lark)	... Cincloramphus cruralis.		
*Rufous-rumped Singing Lark (Sky-lark)	Cincloramphus rufescens.		
*Horsfield's Bush Lark	... Mirafra horsfieldi.		
*Australian Pipit (often locally called "Ground Lark.")	Anthus australis	VIII	36
		XXI	1026
*Coach-whip Bird	... Psophodes crepitans ...	VII	391
		XXI	400
*Grey-crowned Chatterer ...	... Pomatostomus temporalis.		
*White-eyebrowed Chatterer ...	... Pomatostomus superciliosus	XXIII	664
*Chestnut-crowned Chatterer ...	... Pomatostomus ruficeps.		
*Brown Tree-creeper	... Climacteris picumnus ...	XIII	183
*White-throated Tree-creeper ...	... Climacteris scandens ...	XIII	184
		XXIII	664
*Red-eyebrowed Tree-creeper ...	... Climacteris erythrops ...	XIII	183
*White-eyebrowed Tree-creeper ...	... Climacteris superciliosa ...	XIII	184
*Welcome Swallow	... Hirundo neoxena	XXIII	142
*Tree Swallow	... Petrochelidon nigricans.		
*White-breasted Swallow ...	... Cheramœca leucosternum.		
*Fairy Martin	... Lagenoplastes ariel ...	XXIII	234
*Noisy Pitta or "Dragoon Bird"	... Pitta strepitans.		
*Lyre-bird	... Menura superba.		
*Prince Albert's Lyre-bird ...	... Menura alberti.		
*Queen Victoria's Lyre-bird ...	... Menura victoriæ.		
*Bell-bird	... Manorhina melanophrys.		
*White-throated Night-jar ...	... Eurostopodus albigularis ...	VII	381
*Spotted Night-jar	... Eurostopodus argus.		
*Tawny-shouldered Frogmouth ...	... Podargus strigoides... ...	XXII	842
*Plumed Frogmouth	... Podargus plumiferus.		

* Absolutely protected.

AUSTRALIAN BIRDS—*continued.*

Common Name.	Scientific Name.	Vol.	Page
*Owlet Night-jar	Ægotheles novæ-hollandiæ.		
*Azure King-fisher...	Alcyone azurea.		
*Sacred King-fisher	Halcyon sanctus	XXII	503
*Red-rumped King-fisher	Halcyon pyrrhopygius.		
*Macleay's King-fisher	Halcyon macleayi.		
*Great Brown, or "Laughing Jackass"	Dacelo gigas	XXII	842
*Pallid Cuckoo	Cuculus pallidus	XIII	185
*Fan-tailed Cuckoo	Cacomantis flabelliformis ...	XIII XXIV	185 388
*Brush Cuckoo	Cacomantis variolosus ...	XIII	185
*Bronze Cuckoo	Lamprococcyx plagosus ...	XIII XXIV	407 388
*Rufous-tailed Bronze Cuckoo	Lamprococcyx basalis ...	XIII	408
*Black-eared Cuckoo	Misocalius palliolatus ...	XIII	407
*Gang-gang Cockatoo	Callocephalon galeatum.		
*Banks' Black Cockatoo	Calyptorhynchus banksi.		
*Leach's Black Cockatoo	Calyptorhynchus viridis.		
*Yellow-tailed Black Cockatoo	Calyptorhynchus funereus	XXV	873
*Masked Owl	Strix novæ-hollandiæ.		
*Sooty Owl	Strix tenebricosa.		
*Grass Owl	Strix candida.		
*Delicate Owl	Strix delicatula.		
*Boobook Owl	Ninox boobook.		
*Spotted Owl	Ninox maculata.		
*Powerful Owl	Ninox strenua.		
*Egret	Herodias timoriensis.		
*Plumed Egret	Herodias plumiferus.		
*Pacific Heron	Ardea pacifica.		
*Nankeen Night Heron (or Nankeen Crane).	Nycticorax caledonicus ...	XXV	1052
*Straw-necked Ibis	Carphibis spinicollis.		
*White Ibis	Ibis Molucca.		
*Glossy Ibis	Plegadis falcinellus.		
*Sanguineous Honey-eater or "Blood Bird."	Myzomela sanguinolenta.		
*Bourke's Grass Parrakeet	Neophema bourkei.		
*Satin Bower Bird	Ptilonorhynchus violaceus.		
*Cat-bird	Æluroedus viridis.		
*Spotted Cat-bird	Æluroedus maculosus.		

* Absolutely protected.

THE USE OF BORAX AS A METHOD OF KEEPING FLIES FROM BREEDING.

As a result of experiments, the staff of the United States Department of Agriculture have discovered that a small amount of ordinary borax sprinkled daily on manure will effectively prevent the breeding of the typhoid or house fly. Similarly, the same substance applied to garbage, refuse, damp floors, and crevices in stables, cellars, and markets will prevent fly eggs from hatching. Borax will not kill the adult fly, nor prevent it from laying eggs, but its thorough use will prevent any further breeding.

Herd-testing on the Tweed-Richmond Area.

AVERAGE ANNUAL YIELDS OF MILK AND BUTTER.

L. T. MACINNES, Dairy Instructor.

THE following records are of cows testing in those associations controlled by the Tweed-Richmond Herd-testing Council, whose first year's operations closed between 31st December, 1913, and 28th February, 1914.

Of the five associations reviewed, one—Crystal Creek—has not continued testing. The others now are all well advanced in their second year's work. The average returns for this second period should show a marked advance on the ones herewith submitted for perusal, as so far the season for the year 1914 is one of the best experienced on the North Coast, in striking contrast to its predecessor. Apart from the better climatic conditions now ruling, the average quality of the herds in these testing associations has been greatly improved by the heavy culling out practised by the respective owners. Systematic testing has pointed out the unprofitable beast, as the drought with its scarcity of feed drove home the lesson, and her exit as a dairy unit was the result. It is too early yet to perceive the effects obtainable from breeding from the best only. Although there are in the various herds which have been tested many heifers bred from what are now proved to be high butter producers, in the great majority of cases these heifers will only be coming into milk after the lapse of another year.

In making up these yields I have only taken cognisance of those members whose herds were tested at least eleven times (monthly) in the year. The Tweed-Richmond Herd-testing Council kindly permitted me the use of their members' annual record cards, which have been of great assistance. There were many members who missed several tests on account of the severity of the season causing their cows to practically cease milking; others dropped out of testing at the end of the first six months, and others again only commenced to have their cows tested after their district association had been at work some considerable time. Thus, although these five associations had a membership of about 115, the number complying with the conditions required was only 89, and only the records of these members have been used in compiling the following tables. For the year ending 28th February, 1915, the returns should cover a wider area, as in addition to the four associations tabulated here, records should be obtainable from four more units operating between Byron Bay and the Richmond River.

The Tweed-Richmond Herd-testing Council are undertaking the compilation of these returns for the future, and this is by no means the least of the benefits that should accrue to the dairying industry by their means.

TABLE showing Averages, as well as Highest and Lowest, for each District.

Herd-testing Association.	No. of Herds	Twelve months Testing for period ending—	Classification.	Excluding those (mainly Heifers) with only last four monthly tests and Cows with three or less tests.				Excluding those (mainly Heifers) with only last four monthly tests				Including all Cows tested in these Herds during the year.			
				No. Cows.	Milk.	Butter.	Value.	No. Cows.	Milk.	Butter.	Value.	No. Cows.	Milk.	Butter.	Value.
					lb.	lb.	£ s. d.		lb.	lb.	£ s. d.		lb.	lb.	£ s. d.
Condong ...	19	28 Feb., 1914	Highest..	60	5,467	270·5	13 6 5	60	5,467	270·5	13 6 5	61	5,431	269·1	13 4 11
			Average .	1,180	3,414	162·9	8 1 4	1,214	3,341	159·4	7 15 10	1,312	3,173	151·2	7 9 9
			Lowest ..	66	2,282	110·7	5 9 4	68	2,229	108·0	5 6 8	79	2,021	97·7	4 16 6
Uki	22	28 Feb., 1914	Highest...	34	4,000	187·0	9 5 10	31	4,000	187·0	9 5 10	36	3,850	179·8	8 18 8
			Average..	1,199	3,011	143·4	7 2 1	1,269	2,881	137·4	6 16 1	1,355	2,771	131·9	6 10 8
			Lowest ...	70	1,829	94·7	4 12 7	86	1,569	81·7	3 19 10	87	1,562	81·4	3 19 6
Crystal Creek.*	17	31 Dec., 1913	Highest...	115	4,291	222·3	10 17 5	124	4,075	210·8	10 6 2	129	3,906	205·4	10 0 5
			Average.	870	3,594	173·3	8 11 4	902	3·506	169·1	8 7 2	995	3,312	159·0	7 17 4
			Lowest ...	43	2,652	127 6	6 5 2	45	2,567	123·7	6 2 4	50	2,507	120·0	5 18 9
Byron Bay ...	20	28 Feb., 1914	Highest...	53	5,413	259·4	12 16 9	55	5,257	252·1	12 9 6	34	5,020	247·0	12 3 5
			Average..	1,164	3,921	192·3	9 9 8	1,199	3,834	188·1	9 5 6	1,295	3,669	179·5	8 17 1
			Lowest ..	34	2,623	129·7	6 7 9	36	2,524	125·0	6 3 1	37	2,500	122·8	6 1 1
Burringbar...	11	28 Feb., 1914	Highest ..	81	3,575	211·9	10 3 4			None.		89	3,344	197·9	9 10 0
			Average..	780	3,616	182·3	8 19 0			,,		811	3,512	177·2	8 14 0
			Lowest ...	75	3,154	145·2	7 4 7			,,		81	2,967	137·1	6 16 6

AVERAGES for the whole district controlled by the Tweed-Richmond Herd-testing Council.

Condong, Crystal Creek,* Uki, Burringbar, Byron Bay Associations. Eighty-nine Herds' complete records for twelve months.

Classification.	Excluding Heifers with only last four months' tests and Cows with three or less tests.				Excluding Heifers with only last four months' tests.				Including all Cows tested in these Herds during the year.			
	No. Cows.	Milk.	Butter.	Value.	No. Cows.	Milk.	Butter.	Value.	No. Cows.	Milk.	Butter.	Value.
		lb.	lb.	£ s. d.		lb.	lb.	£ s. d.		lb.	lb.	£ s. d.
Highest	60	5,467	270·5	13 6 5	60	5,467	270·5	13 6 5	61	5,431	269·1	13 4 11
Average	5,193	3,495	169·7	8 7 7	5,395	3,396	164·9	8 2 10	5,768	3,262	158·6	7 16 7
Lowest...	70	1,829	94·7	4 12 7	86	1,569	81·7	3 19 10	87	1,562	81·4	3 19 6

* Some herds at Crystal Creek in December, 1913, were not tested—their results were compiled for this month from November tests.

For all cows in those herds completing a full year's testing to 28th February, 1914, the returns are as follow :—

MILK AVERAGES.

	Herd-testing Association.					
	Condong.	Crystal Creek.	Uki.	Burring-bar.	Byron Bay.	Whole area.
Number of herds tested	19	17	22	11	20	89
" cows "	1,312	935	1,355	811	1,295	5,768
Average yield per cow (lb.)	3,173	3,312	2,771	3,512	3,669	3,262
	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.
Percentage of herds yielding 5,000-6,000 lb.	5	.. ...	......	......	5	2·3
Percentage yielding 4,000-5,000 lb. ...	10·5	6	......	9	25	10·1
" " 3,000-4,000 lb. ...	48	65	41	82	50	54
" " 2,500-3,000 lb. ...	10·5	29	41	9	15	22·4
" " under 2,500 lb. ...	26	......	18	......	5	11·2

BUTTER AVERAGES.

	Herd-testing Association.					
	Condong.	Crystal Creek.	Uki.	Burring-bar.	Byron Bay.	Whole area.
Number of herds tested	19	17	22	11	20	89
" cows "	1,312	995	1,355	811	1,295	5,768
Average yield per cow (lb.)	151·2	159·0	131·9	177·2	179·5	158·6
	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.
Percentage of herds yielding 250-300 lb.	5·3	......	......	......	......	1
" " 200-250 "	10·5	6	......	......	25	9
" " 150-200 "	42	47	23	91	50	46
" " 100-150 "	26·4	47	58·5	9	25	36
" " under 100 "	15·8	......	18·5	......	......	8
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Value of average yield per cow, calculating butter at 10d. per lb. and skim milk at 1d. per gal.	7 9 9	7 17 4	6 10 8	8 14 0	8 17 1	7 16 7

The following tables summarise the returns of those herds completing a full year's testing to 28th February, 1914, excluding those (mainly heifers) on their first calf coming in for testing during the last four months of the year :—

MILK AVERAGES.

	Herd-testing Association.					
	Condong.	Crystal Creek.	Uki.	Burring-bar.	Byron Bay.	Whole area.
Number of herds tested	19	17	22	11	20	89
" cows "	1,214	902	1,269	811	1,199	5,395
Average yield per cow (lb.)	3,341	3,506	2,881	3,512	3,834	3,396
	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.
Percentage of herds yielding 5,000-6,000 lb.	5·5	......	......	... ..	15	4·5
Percentage yielding 4,000-5,000 lb. ...	10·5	24	4·5	9	30	16
" " 3,000-4,000 lb. ...	47·5	52	50·5	82	35	50
" " 2,500-3,000 lb. ...	16	24	27	9	20	20·5
" " under 2,500 lb. ...	20·5	......	18	......	......	9

BUTTER AVERAGES.

	Herd-testing Association.					
	Condong.	Crystal Creek.	Uki.	Burring-bar.	Byron Bay.	Whole area.
Number of herds tested	19	17	22	11	20	89
,, cows ,, ...	1,214	902	1,269	811	1,199	5,395
Average yield per cow (lb.)	159·4	169·1	137·4	177·2	188·1	164·9
	per cent.	per cent	per cent.	per cent.	per cent.	per cent.
Percentage of herds yielding 250–300 lb.	5·5	.. ...	... ..	......	5	2·5
,, ,, 200–250 ,,	11	12	......	......	40	13
,, ,, 150–200 ,,	47·5	55	36	91	35	48
,, ,, 100–150 ,,	36	33	59·5	9	20	35
,, ,, under 100 ,,	......	......	4·5	......	......	1·5
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Value of average yield per cow, calculating butter at 10d. per lb. and skim milk at 1d. per gal.	7 15 10	8 7 2	6 16 1	8 14 0	9 5 6	8 2 10

A similar summary is given of those herds completing a full year's testing to 28th February, 1914, excluding—

(*a*) Those (mainly heifers on first calf) coming in during last four months of the year.

(*b*) Cows not having more than three tests (one per month) through death, disablement, or being culled out.

MILK AVERAGES.

	Herd-testing Association.					
	Condong.	Crystal Creek.	Uki.	Burring-bar.	Byron Bay.	Whole area.
Number of herds tested	19	17	22	11	20	89
,, cows ,, ...	1,180	870	1,199	780	1,164	5,193
Average yield per cow (lb.)	3,414	3,594	3,011	3,616	3,921	3,495
	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.
Percentage of herds yielding 5,000–6,000 lb.	5·5	......	......	......	15	4·5
Percentage yielding 4,000–5,000 lb. .	16	24	4·5	9·5	30	16·5
,, ,, 3,000–4,000 lb. ...	42	58	55	90·5	35	53
,, ,, 2,500–3,000 lb. ...	20·5	18	22·5	......	20	17·5
,, ,, under 2,500 lb. ...	16	......	18	......	......	8·5

BUTTER AVERAGES.

	Herd-testing Association.					
	Condong.	Crystal Creek.	Uki.	Burringbar.	Byron Bay.	Whole area.
Number of herds tested	19	17	22	11	20	89
,, cows ,, ...	1,180	850	1,199	780	1,164	5,193
Average yield per cow (lb.)	162·9	173 3	143·4	182·3	192·3	169·7
	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.
Percentage of herds yielding 250–300 lb.	5·5	......	......	......	5	2
,, ,, 200–250 ,,	11	12	......	9·5	40	14
,, ,, 150–200 ,,	46·5	64	41	81	35	51·5
,, ,, 100–150 ,,	37	24	54	9·5	20	31
,, ,, under 100 ,,	......	......	5	......	......	1·5
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Value of average yield per cow, calculating butter at 10d. per lb. and skim milk at 1d. per gal.	8 1 4	8 11 4	7 2 1	8 19 0	9 9 8	8 7 7

Conclusions.

Including the records of all cows in those herds completing a twelve months' testing to 28th February, 1914, in the associations under review, the average yield per cow for the highest-yielding herd (61 cows) is seen to be £13 4s. 11d., which is £5 8s. 4d., or 69 per cent., above the average obtained by the whole of the district stretching from Bangalow on the south to the Queensland border (Tweed River) on the north. On the other hand, the average return made by the lowest-yielding herd was about only one-quarter that made by the highest, and was £3 19s. 6d., or no less than £3 17s. 1d., or 49 per cent., below the district average.

Regarding the units of this very low-producing herd, it is not contended that they are the worst cows in the testing herds. The conditions under which they existed may have been much harder, and in such circumstances the best of cows must suffer physically and temperamentally, thereby injuriously affecting the yield of milk and butter fat.

In the case where all records from those coming in (mainly heifers on their first calf) during the last four months of the testing year are excluded, the district average is seen to be £5 3s. 7d. below that of the highest-yielding herd, while it is £4 3s. per cow above the lowest.

Turning to the records in that table where are excluded—

(*a*) Those (mainly heifers on their first calf) testing during the last four months of the year only.

(*b*) Cows having only three or less tests through death, disablement, or otherwise culled out.

This return shows what might be styled the normal average yield after eliminating those cows and heifers that were, from various circumstances, unable to give a fair indication of their capacity to produce milk and butter fat.

The highest return given by any one herd was £4 18s. 10d. per cow above the average obtained by the whole of the five centres enumerated above, and at the same time it was £8 13s. 10d. per cow above the lowest-yielding herd average, which in its turn was £3 15s. per cow *below* the district average return.

As shown, the average return of these 5,193 cows was £8 7s. 7d., calculating butter at 10d. per lb. and skim milk at 1d. per gallon. This gives a total cash return of £43,513 0s. 3d. If the whole of these herds had yielded on the same basis as that of the highest return, viz., at £13 6s. 5d. per head, the incomes of the eighty-nine members of these five testing associations under review would have been increased during this one period of twelve months by no less a sum than £25,662 1s. 6d.

Among the cows testing in these associations are those from the best herds in their respective districts. So it may be taken that the returns of those farmers who remain outside the sphere of the testing movement are, on the average for the same period, below that given above, viz., £8 7s. 7d. per cow.

On the other hand, the period covered by the year's testing coincided with the worst season, from a dairyman's point of view, yet experienced on these rivers. Under average climatic conditions it would certainly be much higher.

A few of the members at first did not enter the whole of their milkers. The cows which were omitted were, in the great majority of cases, tested as soon as the result of the first month's work was demonstrated. This meant for such herds that the yields of these cows for at least that month were not credited to the herds' average for the twelve months, thereby slightly diminishing the actual return. Taking all factors into consideration, the foregoing returns, therefore may be said to represent the minimum average yield per cow.

Seed Testing for Farmers.

The Department is prepared to test vegetable and farm crop seeds. Reports will be given stating the germination capabilities of the seed, its purity, and the nature of the impurities, if any.

Communications should be addressed to the Director, Botanic Gardens, Sydney. Not less than 1 ounce of small seeds such as lucerne, or 2 ounces of large seeds like peas, should be sent. Larger quantities are to be preferred. Seeds should be accompanied by any information available as to origin, where purchased, age, &c.

If a purity report only is desired, it should be so stated, to secure a prompt reply. Germination tests take from six to twenty days, according to the seed.

Official Milk and Butter Records.

M. A. O'CALLAGHAN.

ANOTHER batch of records is presented this month. There is nothing very unusual in any of the figures.

The best record is that of the cow Merrythought in Mr. J. Davies' herd at Nundorah, Scone, this cow giving 451 lb. of butter, and showing that she was producing nearly 1½ lb. of butter a day on the last day of the test.

Mr. F. G. Flower's Jersey Herd.

Period of Test.	Name of Cow and Herd Book No.	Age at beginning of Test.	Date of last Calving.	Total Milk.	Total Butter.	Average Butter Fat Percentage.	Yield on last day of Test.	
							Milk.	Butter.
days		y. m.		lb.	lb.		lb.	lb.
222	Melba	6 0	17 Jan., 1913 ...	3,962	228	4·9	8·00	·44
261	Silvery	6 0	1 Dec., 1912 ...	5,556	335	5·6	1·50	·11
232	Patch	6 0	7 Nov., 1912 ...	3,722	205	5·7	1·50	·14
237	Lola	5 0	1 Nov., 1912 ...	4,358	250	5·4	1·50	·11
248	Pansy I	7 0	23 April, 1913 ...	4,327	245	5·0	11·50	·77
273	Lizzie, 2245	7 0	8 Sept., 1913 ...	4,846	273	5·1	10·00	·79
273	Lucy, 2257	6 0	6 Aug., 1913 ...	5,110	284	4·9	13·50	·95
273	Molly I, 1238	6 0	7 Oct., 1913 ...	4,082	239	5·4	8·00	·58
273	Sunshine, 2669	Calved 1907.	27 Dec., 1913 ...	4,989	293	5·3	12·00	·69
273	Candelo	Calved 1906.	20 Jan., 1914 ...	5,493	343	5·6	15·00	1·03
273	Fortune, 1021	Calved 1906.	27 Jan., 1914 ...	4,890	298	5·6	10·50	·66

Mr. E. P. Perry's Guernsey Herd.

Period of Test.	Name of Cow.	Age at beginning of Test.	Date of last Calving.	Total Milk.	Total Butter.	Average Butter Fat Percentage.	Yield on last day of Test.	
							Milk.	Butter.
days		y. m.		lb.	lb.		lb.	lb.
273	Golden Rose IV (imp.)..	2 4	17 Jan., 1914 ...	3,975	206	4·5	14·75	·80
273	Mignotte VII	4 2	27 Oct., 1913 ...	6,872	386	4·9	16·50	1·05
273	La Colombe III	......	8 Dec., 1913 ...	6,331	344	4·8	16·50	·91

Mr. Dixon Cooke's Shorthorn Herd.

Period of Test	Name of Cow.	Age at beginning of Test.	Date of last Calving.	Total Milk.	Total Butter.	Average Butter Fat Percentage.	Yield on last day of Test.	
							Milk.	Butter.
days		y. m.		lb.	lb.		lb.	lb.
243	Sweetheart	5 0	8 Sept., 1913 ...	5,623	284	4·3	13·50	·89
243	Melody	4 0	1 Sept., 1913 ...	4,410	226	4·6	5·25	·35
273	Pretty Maid	13 0	2 Feb., 1913 ...	6,014	241	3·4	14·00	·63

Mr. W. C. Higinbotham's Jersey Herd.

Period of Test.	Name of Cow and Herd Book No.	Age at beginning of Test	Date of last Calving.	Total Milk.	Total Butter.	Average Butter Fat Percentage.	Yield on last day of Test. Milk.	Yield on last day of Test. Butter.
days		y. m.		lb.	lb.		lb.	lb.
273	Candry XVI, 295 ...	7 2	22 Sept., 1913 ...	5,698	317	4·8	11·25	·61
273	Defender's Beauty, 1813..	3 2	19 Oct., 1913 ...	4,758	283	5·3	10·00	·76
273	Miss Trenton V, 2367 ...	9 7	4 Oct., 1913 ...	4,615	281	5·4	5·25	·35
273	King's Trenton	3 7	6 Oct., 1913 ...	4,551	238	4·5	10·00	·53
273	Canary XIX, 298 ...	7 4	12 Nov., 1913 ...	5,843	337	5·0	17·75	1·19
273	Fairy's Princess	4 4	12 Nov., 1913 ...	5,266	231	3·9	13·25	·74
273	Jess III of Tilbuster, 2124	3 0	3 Nov., 1913 ...	3,441	238	6·1	9·00	·74
273	Blossom's Fancy, 1593 ...	5 0	27 Nov., 1913 ...	5,675	322	5·0	18·50	1·17
273	Lady Elton, 2166 ...	6 0	2 Dec., 1913 ...	5,313	310	5·1	11·50	·74
273	Starbright, 730	6 8	28 Nov., 1913 ..	6,165	346	5·0	15·75	1·08

Mr. J. Davies' Jersey Herd.

Period of Test.	Name of Cow and Herd Book No.	Age at beginning of Test.	Date of last Calving.	Total Milk.	Total Butter.	Average Butter Fat Percentage.	Yield on last day of Test. Milk.	Yield on last day of Test. Butter.
days		y. m.		lb.	lb.		lb.	lb.
273	Cluster, 913	6 0	8 July, 1913 ...	4,953	302	5·4	6 75	·45
273	Jessie's Starbright, 1098	5 0	22 Aug., 1913 ...	4,833	299	5·4	15·50	1·00
273	Molly of Tressingfield 1240.	5 0	27 Sept., 1913 ...	8,650	466	4·7	18·75	1·23
273	Carrie's Fox, 896 ...	5 0	22 Oct., 1913 ...	7,051	420	5·2	16·00	1·03
273	Merrythought, 1219 ...	5 4	24 Dec., 1913 ...	6,233	451	6·2	19·25	1·46
273	Puen Buen Buttercup II.	1 11	24 Dec., 1913 ...	6,110	347	4·9	22·75	1·41
242	Milkmaid 36th, 592 ...	7 0	29 Sept., 1913 ..	4,901	295	5·1	16·25	·93
273	Spinet, 1399	5 3	11 Jan., 1914 ..	5,503	314	5·0	20 00	1·25
243	Ballet Girl II, 256 ...	8 6	14 Jan., 1914 ..	4,153	252	5·2	12·25	·79
273	Carnation Columbus, 894	6 3	19 Jan., 1914 ...	4,135	281	6·0	13·75	1·03

Mr. O. H. Gollan's Jersey Herd.

Period of Test	Name of Cow and Herd Book No.	Age at beginning of Test.	Date of last Calving.	Total Milk.	Total Butter.	Average Butter Fat Percentage.	Yield on last day of Test. Milk.	Yield on last day of Test. Butter.
days		y. m.		lb.	lb.		lb.	lb.
205	Cherry III, 1694... ..	4 0	3 Nov., 1912 ...	3,415	226	5·7	11·50	·73
224	Berkley, 1581	6 0	15 Jan., 1913 ...	4,345	241	4·8	7·50	·50
163	Gentle Lass II, 2013 ..	7 0	15 Oct., 1912 ...	5,291	258	4·2	19·25	1·00
174	Brighton Violet, 1627 ...	4 0	4 Dec., 1912 ...	3,155	215	5·9	11·75	·87
249	Vera	4 0	20 Jan., 1913 ...	3 421	236	6·0	6·50	·49
273	Trinket II	4 0	22 Jan., 1913 ...	4,948	320	5·6	18·00	1·09
243	Woodburn Buttercup ...	8 0	28 Mar., 1913 ...	4,281	202	4·1	14·50	·63
273	Luxury, 2264	10 6	18 Aug., 1913 ...	6,457	377	5·2	8·75	·60
273	Elsie of Woodburn, 1896.	3 9	4 Sept., 1913 ..	4,352	321	6·5	9·50	·92
273	Actress	3 0	22 Oct., 1913 ...	3,213	205	5·5	6·00	·51
273	Myrtle I	6 0	24 Sept., 1913 ...	4,811	284	5·2	6·50	·41
243	Canary's Laurel, 1671 ...	4 0	7 Sept., 1913 ...	3,509	205	5·3	5·00	·42
273	Fanny	8 0	21 Sept., 1913 ...	5,827	323	4·7	12·00	·75

Feeding Experiments in Denmark with Dairy Cattle.

W. HELMS.

[The following paper, made available by the courtesy of the writer, conveys some information collected by him during a recent visit to Denmark. Though the conditions under which the trials were conducted differ widely from those that obtain in New South Wales, there are features of the results that are certain to stimulate thought and discussion.—Ed.]

If one goes deeply into the feeding of dairy cattle, so very important to dairy-farmers, one naturally asks first:—

1. What regulates the feeding, and what indications are there to show whether the cows have had enough, too little, or too much to eat?
2. How much feed does a cow require, what should the feed consist of, and how often should feed be given?

There does exist a certain relation between a cow's condition and its milk-production, a certain relation, so to speak, between consumption of food and yield of milk, which must be studied, and it is therefore absolutely necessary to control and watch that condition and milk-production, so that the former, for instance, by too heavy feeding, does not increase at the expense of the latter, or, *vice versa*, so that the latter, by too scanty feeding, does not increase at the expense of the former, due consideration being given, at the time of feeding, to the various periods between "in calf" and "calving."

By doing this, we come to know the cows which do not yield milk in proportion to the value of the feed given, and which should be sold for consumption.

It is impossible to lay down rules for a fixed quantity or quality of feed to be given, nor can one give a fixed recipe, as this would demand a greater knowledge of various matters, mainly, the process of digestion and the benefits derived from the various foods; but we have come so far, through painstaking efforts and trials (and after all any scientific investigation is often explanation of and basis for practical work), that one can say that the feeding must be based on systematic principles, varying for individual cows as regards an increase or decrease in quantity and quality of feed, but also based on principles of economy, and on lines suited to the animals in question.

It may be mentioned here that the bull should not be fed as well as the cows, because he has only to preserve condition and should not be too fat, otherwise he becomes too lazy. This is often avoided in Denmark and some other European countries by letting the bull do some light work, such as drawing water or fodder carts.

It is only natural that we should first like to know the value of grass as fodder, and how much a cow eats of it per day. The question has been "answered," in a way, by a father and son who were dairying together, the former giving an estimate of 300 lb. per day, and the latter 30 lb. It seems, therefore, that this question demands further investigation, and some account of a series of trials that has been conducted in Denmark will be of interest.

The Observation Trials.

Two lots of cows were made up, consisting of six cows each, that, at the time of the commencement of the experiments, had been similarly fed, and were practically the same as regards weight, age, milk-yield, and other conditions, such as time of calving, &c.

The cows were put out on grass, and tethered within large measured circles, and at the end of the day the grass left within the circle was cut and weighed.

This method of investigation occupied fourteen days, and the following results were obtained:—

1. The quantity of grass consumed by cows varies, not alone as between one cow compared with another, but also in the individual cow from day to day. This variation is not alone dependent on weather conditions, such as wet, cold, or very warm weather, when the consumption is smaller, but also independently of such conditions.
2. The cows consumed about the same quantity, whether they were dry or in milk, whether giving a smaller or greater milk-yield.
3. The quantity of grass consumed per cow per day was about 155 lb.
4. A reduction in the milk-yield took place, although the grass was young and fresh.

In connection with these trials, observations were made on rainfall and temperature, and botanical analyses were also made of the paddock, so as to estimate the percentage of the various grasses and weeds growing therein.

Finally the cows were weighed, and all showed a loss in weight amounting to an average of 85½ lb. per cow in the fortnight.

Further comments on this and on other features of the whole series of trials will be made later. This particular trial was made principally as a forerunner to other trials, so as to find out how much grass the cows should receive.

The Preparatory Trials.

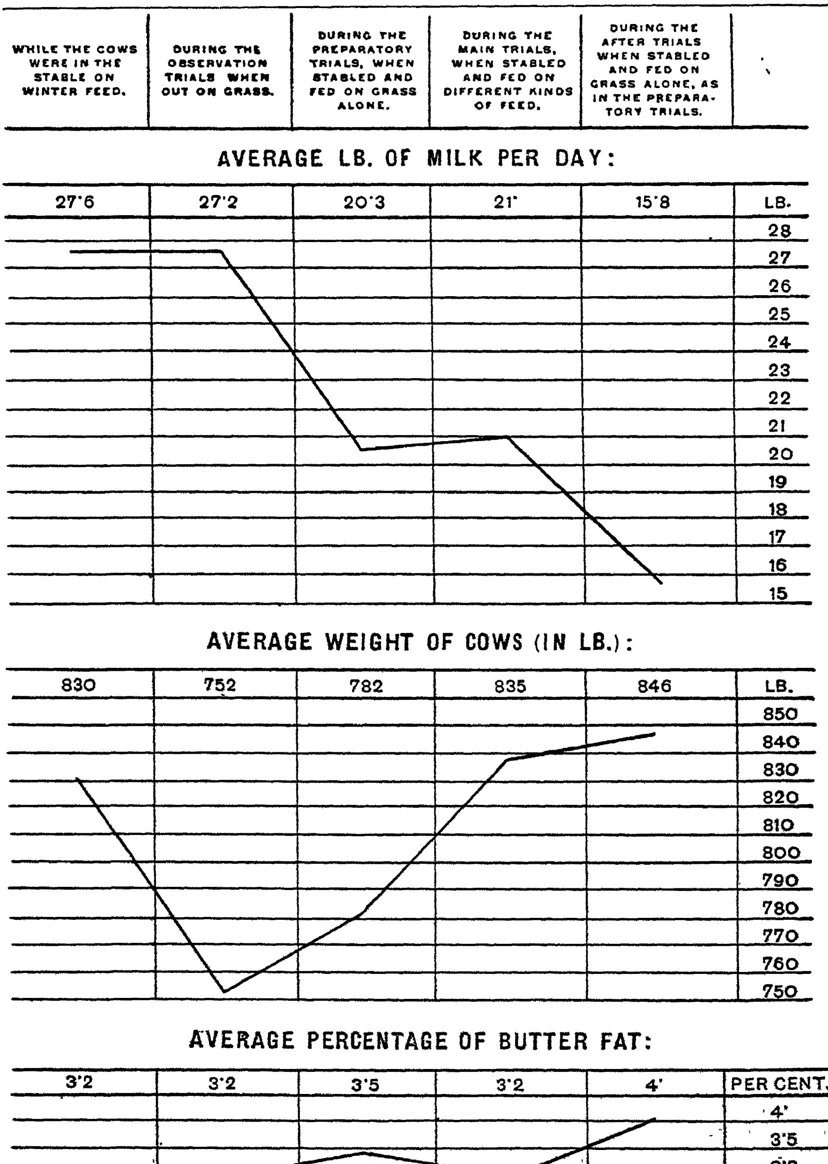
In these, both lots of cows were stabled three weeks, during which time they received nothing but grass, but as much of that as they could eat.

It was soon seen, however, that the quantity of grass consumed became less and less, the consumption falling to a minimum average of 82½ lb. per day per cow, which resulted, of course, in a reduction in the milk-yield.

This falling off in appetite was undoubtedly due to the facts that—(1) the grass was getting older and coarser; (2) as the grass was served out as

cut grass, the cows could not pick and choose as they could in the paddock, but had to take the root end as well as the top part; (3) the life in the stable was not so favourable to the development of a good appetite as the out-door life.

DIAGRAM SHOWING RESULTS OF FEEDING TRIALS WITH DAIRY CATTLE IN DENMARK.



The Main Trials.

In these the two lots were treated to different kinds of feed, such as oilcake, oats, grass, and straw, in varying quantities and various combinations, so that in each case the necessary nitrogenous matter, carbohydrates, and filling fodder were supplied. Furthermore, the lots were exchanged in the course of the trials, so as to give both lots the same conditions and chances.

The trials extended over three weeks, and the milk was, as in the other trials, weighed and tested for butter-fat.

The conclusion arrived at as a result of the trials was "that a rise in milk-yield took place when this systematic feeding was adopted, especially when feeding on oilcake, of which 1 lb. is said to equal about 10 lb. of grass in milk-producing nourishment."

The After Trials.

In these, the two lots were, as in the preparatory trials, treated to nothing but grass, but as much as they could eat. Here it was observed "that the quantity of grass consumed fell to a minimum average of 59½ lb. per day per cow, resulting, of course, in a sudden and serious reduction in the milk-yield, not so much due to the smaller quantity of grass consumed, as to it being old and thus of poorer quality, which made the work of digesting it considerably greater."

The accompanying figures and curves summarise the results of these trials, and enable the ensuing comments to be more clearly understood.

What the Trials Suggested.

Looking at the figures and curves, we find illustrations of some of the points referred to before, namely:—

1. A reduction in the milk-yield took place at once when the cows were shifted out to grass from the stables, where they had had heavy winter feed, although the grass was at its best, namely, fresh and not dry.
2. A sudden and heavy reduction in the milk-yield took place when the cows were shifted from the paddock into the stable and fed on grass alone, although sufficient grass was provided.
3. A rise in the milk-yield took place when systematic feeding with other feeds was adopted.
4. A sudden, and heavy, reduction in the milk-yield again took place when the cows were again fed on grass alone, although it was provided in sufficient quantities.
5. A sudden and heavy loss in the average weight took place as soon as the cows were shifted from the stable out on grass.
6. This loss in weight was regained steadily through the trials.
7. The butter-fat percentage did not vary very greatly during the trials, but rose at the last stage, in the after trials.

Although some comments on, and explanation of, these results have already been made, a summary may also be made of these.

The heavy and sudden loss in weight from stable to field cannot be due to any actual reduction in the quantity of the feed, seeing that each cow consumed 155 lb. of grass, nor did the milk-yield, satisfactory in quantity as well as quality, indicate any reduction in the quality of the feed at that time. The principal reason for the loss in weight seems therefore to be the sudden change from one kind of fodder to another—from a dry one to one which contained no less than 82 per cent. of water. The digestive organs evidently had difficulty in accommodating themselves so quickly to this change in fodder; the secretion of the gastric juices had been excessive, and this, together with the loosening effect of the green grass, had caused a certain amount of scouring, and the cows had thus discharged, through the excrements, not alone large quantities of water, but also sustaining organic matter from the feed and from the body. Other factors undoubtedly also contributed, such as a lower temperature and the greater amount of exercise which cows out on grass enjoy.

There is an idea abroad that if cows get overfed (that is, more feed than necessary for milk-production) such surplus goes to build up weight, and forms some sort of reservoir, which can be drawn on later, if necessary, in the production of milk, but such an idea can by no means be accepted as a correct one.

As mentioned at the beginning, there seems to be a certain relation between condition and milk-production. A drop in the latter may be followed by an increase in the former, as seen in the preparatory trial, where the feed was evidently utilised in building up condition in preference to the production of milk. It may be said, with some degree of certainty, that in the ordinary course of events condition goes before milk-yield, and that the carbo-hydrates (supplied by young grass, oats, straw) principally furnish the former, whereas nitrogenous foods (such as oilcake) furnish the latter.

As also mentioned before, there is some difficulty in analysing correctly the process of digestion and the benefits of the various foods. For instance, not only does the composition of the grass, the mainstay of fodder, vary from day to day, and thus also the percentage of digestible contents therein, but there are also many other factors at work which make such investigations difficult.

Nevertheless, one may almost say that cows in Denmark are fed according to analysis, and fairly correct calculations can be, and have been made, estimating, out of a total quantity of feed consumed, the quantity of nourishing matters which the cow has utilised in (1) sustaining condition, (2) production of milk, and (3) adding to its condition.

As an example, the results of one of these calculations is given in the accompanying table. The analysis of the milk showed 3·50 per cent. butter-fat, 3·75 per cent. albuminoids, 4·5 per cent. sugar.

TABLE showing weights and percentages of nitrogenous and carbo-hydrate matter used by cows in 100 days for various purposes.

	Used in sustaining condition.		Used in production of milk.		Used in adding to condition.		Total.	
	lb.	per cent.	lb.	per cent.	lb.	per cent.	lb.	per cent.
Nitrogenous matter ..	55	38	81	56	9	6	145	100
Carbo-hydrates ..	660	60	278	25	161	15	1,099	100
Total	715	...	359	...	170	...	1,244	...

Though these trials were mere experiments to be continued, certain points have been fairly well established:—

1. Feeding with, and on grass alone, quite apart from the loss sustained by letting the cows themselves decide how much grass to consume, cannot give us the most profitable results with dairy cattle, and even if other fodder be added to the grass-feed a loss of nourishing organic matter can hardly be avoided.
2. On account of the varying quality of the grass, especially as it gets older and its digestibility alters, it is difficult to recommend any certain fodder composition when grass also is given.
3. The feeding in summer time must be even, and based on similar systematic principles to the winter feeding, viz., in proportion to the condition and milk-production of the various cows in the various periods between "in calf" and "calving."
4. On no account must the change from paddock feed to stable feed, or *vice versa,* be too sudden, bearing in mind that it takes time before the effect of one class of feeding is superseded by the effect of another. The change should be a gradual one, extending over a fortnight, so that the cow's digestive organs can become accommodated to the change, otherwise the nourishment will not be absorbed, loss in condition will follow, and additional milk-yield will be too dearly bought.

To the dairyman the most important question raised by such a series of trials is, in what way can we most economically and profitably make use of the grass, avoiding any waste, such as that caused by the cattle tramping it down, when there is plenty of it? Hardly less important is the question, how can we best, and most economically, make up the loss in quality and quantity of that grass—a loss which generally takes place later in the summer in Denmark, and with us in Australia in time of flood, drought, or frost?

Reviewing the trials just described, there are several points that the men who have conducted the trials with so much patience and skill (and who are continuing them with the object of learning more) admit are unexplainable, and they distinctly warn us not to look upon the result of the trials as fixed rules, but as guiding factors only.

Looking at the fall and rise in the milk-yield during the various trials, we can understand the drop when, in the observation trials, the cows were taken from a rich winter feed in the stable out on to the paddock, although

the grass was then at its best. An instance of what such a winter-feed consists of will make it even more explainable.

The daily supply (divided into two or there feeds) for a medium-size dairy cow weighing between 1,000 and 1,100 lb., and yielding about 1 gallon of milk per day, is from 50 to 70 lb. fodder, the weight varying according to the amount of nourishment contained therein; the same-sized cow, but yielding about 4 gallons per day, receives from 70 to 130 lb. The fodder may consist of hay, straw, turnips, oilcake, sugarbeet refuse, and pollard and bran mixed with molasses. Only the maximum and minimum feed for a certain-sized cow with a maximum and minimum milk-yield are mentioned here, but between these lie varying quantities of feed calculated on every gallon of difference in milk-yield, and similar calculations are likewise made out for cows of various weights, a division into three classes being made thus:—Large cows, weighing from 1,300 lb. to 1,200 lb; medium cows, weighing from 1,100 lb to 1,000 lb.; small cows, weighing from 900 lb. and under.

The drop again in the milk-yield, in the preparatory trials, can also be understood, because in these the cows were shifted from a paddock to a stable, where they did not receive any fodder but grass, which, in quality, was not as good as that in the paddock.

Then, in the main trials, comes a rise, the cows in the stable being fed on different kinds of nourishing feed. Although $\frac{3}{4}$ per cent. is of some moment, one would have expected the rise to be greater, and the reason perhaps is that it takes time for the effect of one class of feeding to be superseded by that of another.

Finally, we can well understand the sudden and serious drop in the after-trials, when the cows in the stable are again put on grass feed only, because the grass is still older, and its quality therefore poorer. It should also be remembered that the grass feed has evidently and principally been used for regaining lost condition.

If we now consider that the milk-yield in the observation trials when the cows were out on grass was fairly satisfactory, one feels inclined to ask, provided the grass in a paddock remains plentiful, would it not be better to let cows remain there, without giving any additional feed? It has to be remembered, however, that, although the quantity of grass may be there, the quality is not, because it is reduced as the grass gets older. Nor is young grass without some bad effects, as we have seen in the quickly reduced condition of the cow, due, among other things, to the scouring action of the grass.

The belief, that condition goes before milk-production, is well illustrated in the trials, but no one can give me any explanation why the cows in the observation trials, whether dry or in milk, or whether giving a smaller or greater milk-yield, should consume about the same quantity of feed when put out on grass. Nor can any reason be given for the small variations in the percentage of butter-fat during the trials, nor for the sudden rise in it in the after-trials, except that a fall in quantity is often followed by a rise in quality.

Productive Capacity of New South Wales Dairy Cows.

HERD RECORD COMPETITIONS ON THE TWEED RIVER.

M. A. O'CALLAGHAN.

THANKS to the establishment of Herd-testing Associations on the Tweed and Richmond Rivers, it looks as though we were going to get some solid educational work done in connection with the Agricultural Shows in those districts. Not but that the Agricultural Societies in those districts have done, comparatively speaking, good work in the past, but they have now the opportunity of doing very much better work, and work of a more thoroughly practical kind, than that which was possible prior to the general establishment of Herd-testing Associations in the district.

At the Show held a year ago at Murwillumbah, the Tweed River Agricultural Society put forth a valuable educational effort in the way of stimulating interest in a competition among herd-testing societies, as represented by the individual farmers in those districts. The period of test then covered six months, but this year the Society was in a position to extend competition over the full twelve months ended 31st August last, and the information made public by the Society, as a result of this competition, is of a very valuable character from an educational point of view. Of course, all this information could have been got through the Council of the Herd-testing Association, but without the competition referred to there would be a certain stimulus lacking and the same keenness in seeing that everything was in sound order would not have prevailed.

The figures now made available may be regarded as absolutely authentic, as these herds were under careful review all the time, and the figures have been carefully checked over so as to avoid possible errors. In the competition referred to four herd-testing associations competed. The Bangalow Association was represented by 26 herds, the Condong Association by 13, the Byron Bay Association by 11, and the Eungella Association by only 1, making a total of 51 herds competing. So as to allow for any possible accidents which would throw a herd out of the competition, as well as to avoid the necessity of having heifers in their first-calf in the competition, the number of cows in each herd competing for the prize was fixed at 80 per cent. of the herd. In all, 2,991 cows were entered in the competition. Out of the 51 herds entered 20 succeeded in producing, on the average, 200 lb. of butter per cow for the year. Thirty-one herds failed to reach this standard on the average. In considering this question of standard, however, it must

be borne in mind that for the year ended 31st August, 1914, we had at least six bad months on the Tweed River; hence the records do not represent what the district would produce for an average year.

The production of the winning herd, the property of Mr. J. Anderson, of Condong Association, is on a very high scale, showing an average of 308·8 lb. of butter per cow. This represents a butter value, at the average price of 10½d. per lb., of £13 10s. per cow per year. The other side of the question, however, is shown by the herd which obtained last place in the competition, with a production of only 97 lb. of butter per cow, the number of cows under test being 42. This represents a butter value of only £4 4s. 10d. per cow for the year. It would be difficult to imagine how this latter farmer made ends meet during the year. He was, probably, one of those who got caught by the drought without any fodder under cultivation, and consequently his herd suffered accordingly.

Herds below a Paying Standard.

The paying standard, which I have estimated as holding good in Australia, is 182 lb. of butter per cow. Of the herds tested, 16 fall below this, but, as stated before, the year was such a severe one that the probability is that with a little culling these particular herds could be brought on to a paying standard.

The largest yield by any one cow was 592 lb. of butter. This is a good record, but I understand that this cow slipped her calf and was in milk for practically twelve months. The next best record was 474 lb. of butter—a very creditable performance indeed.

SUMMARY of Results of the Tweed River Agricultural Society's Competition for Best Yielding Herd in any Registered Herd-testing Association.

Order of Merit.	80 per cent. of Herd.	Average per Cow. lb Butter.	Order of Merit.	80 per cent. of Herd.	Average per Cow. lb Butter.	Order of Merit.	80 per cent. of Herd.	Average per Cow. lb Butter.
1	50	308·86	18	54	204·19	35	64	182·96
2	41	262·54	19	42	203·2	36	43	180·05
3	61	252·5	20	54	202·85	37	60	175·62
4	48	252·002	21	54	199·46	38	69	170·79
5	82	243·79	22	50	198·37	39	42	170·79
6	69	240·009	23	61	197·57	40	38	167·78
7	33	235·83	24	79	196·42	41	57	166·15
8	29	234·26	25	57	195·83	42	106	158·43
9	34	233·009	26	62	193·41	43	63	152·86
10	117	230·92	27	54	192·25	44	78	148·73
11	66	226·18	28	47	190·25	45	61	145·64
12	66	225·98	29	73	189·51	46	60	144·43
13	58	225·41	30	49	189·19	47	53	140·35
14	46	214·97	31	70	188·91	48	74	133·38
15	30	210·28	32	80	187·38	49	48	121·81
16	53	210·23	33	74	185·8	50	76	119·56
17	38	206·93	34	76	183·34	51	42	97·08

General average per cow, 193·88 lb. butter.

If anything will stimulate farmers to cull their herds and to continue testing their cattle, it will be a review of the figures presented in the table. The conditions and the nature of the country covered by this competition are to a great extent similar, and with odd exceptions there is no reason, except want of knowledge and experience, why one farmer should not be approximately as good as another.

The general average of all cows tested is put down at 193·8 lb. of butter per cow. If all the cows on the Tweed and Richmond Rivers averaged this amount during the year under review they would have paid their way and left a decent profit to meet contingencies. Next year's results will be looked forward to with very great interest, because that district is now experiencing a most bountiful season, and it is only want of good management which will cause any farmer to be unable to feed his cows well during the current season.

Twenty-four Years' Index to the "Agricultural Gazette."

A consolidated author and subject index of the *Agricultural Gazette* for the twenty-four years 1890 to 1913, inclusive, has just been completed, and is now available for distribution. The work is in the nature of a second edition to the first consolidated index, published in 1910, but, in addition to the whole of the contents of that publication, it includes modifications suggested by officers of the Department, together with the index for the following four years, which thus completes it to the end of 1913.

When in 1910 the first issue was offered to farmers and to the numerous workers in the field of agricultural research in Australia and elsewhere, it was accorded a warm welcome as a most useful means of reference to the great variety of subjects dealt with in the *Gazette*. The scope and design of the index was the work of Mr. H. C. L. Anderson, M.A., then Under-Secretary of the Department of Agriculture, who, notwithstanding the immense amount of labour involved in the compilation, was constrained to admit that it fell short of his ideal, and steps were instituted immediately to secure the assistance of officers of the Department in making the work of still greater value. The present publication is the result of these combined efforts. It contains the whole of the contents of the first edition, together with the modifications and additions suggested by officers, and it incorporates the index for the following four years.

It is not intended to publish this consolidated index again, but supplements will hereafter be issued at intervals of about five years.

Every owner of files of the *Gazette* for the past few years should possess a copy of this index, which may be had on application to the Government Printer at 5s.

Fungus and Other Diseases of the Apple.

[Continued from Vol. XXV, page 1044.]

G. P. DARNELL-SMITH, B.Sc., F.I.C., F.C.S., Biologist; and E. MACKINNON, B.Sc., Assistant Biologist.

Bitter Pit.

THIS disease of the apple was so named in 1895, although the disease had been noted many years previously. It often appears when the fruit is on the tree, but it sometimes becomes visible only in store. It has been the subject of special inquiry by Mr. D. McAlpine since 1911, and the following notes are largely compiled from his reports in 1912 and 1913.

Affected apples have upon them more or less numerous, slightly depressed, roundish spots or pits, from $\frac{1}{8}$ inch to $\frac{1}{4}$ inch in diameter (Fig. 10). In most cases the colour of the spots is normal—that is, they are of the same colour as the skin of the apple adjacent to them. Beneath the pits, however, the fruit is coloured brown for some distance towards the core, the affected area gradually lessening in width; the discoloured portion is, in fact, usually like a small cone in shape. This discoloured portion, although decayed in one sense, does not cause the adjacent parts to rot. Very frequently, between the small brown discoloured cone and the depression corresponding to it on the surface of the apple, a thin layer of normal flesh is to be seen. The brown spots may, or may not, taste bitter. Bitter Pit is neither contagious nor infectious; it is, however, widely distributed, being known in Australia, the United States, Canada, Europe, and Africa.

Examined under the microscope the brown cells are seen to be collapsed and to contain numerous starch grains, whereas the healthy cells of a ripe apple are turgid and contain no starch granules.

The rotting of fruit affected with Bitter Pit is characteristic. The apple as a whole turns brown, the pulp becomes soft, shrivelled, and shrunken, but there is no breaking of the skin. Trees that produce fruit with Bitter Pit may be perfectly healthy otherwise.

Sometimes the spots are found, not just beneath the skin, but right in the pulp; sometimes they are so numerous that they touch each other. Sometimes they are so large as to no longer resemble spots; they then form irregular brown patches, often showing cracks or cavities when cut across (Fig. 12).

Apples thus affected are nearly always unsymmetrical, and are said to be affected with "Pig-face," "Stigmonose," "Crinkle," or "Confluent Bitter Pit." When an apple badly affected with "Crinkle" is cut across it is always

found that the tubes, or vascular bundles, through which nourishment passes from the apple tree to the apple, are in some way defective. This throws a most important light upon the cause of Bitter Pit, and to the study of this vascular system in some detail we now turn.

It may be explained that the sap travels from the apple tree to the developing apple along the so-called fibro-vascular bundles. In each bundle a series of very minute tubes run parallel to one another (hence the name vascular bundle), and interspersed with them is a certain amount of fibrous tissue, whence the name fibro-vascular bundle. As each bundle passes towards its ultimate termination the fibres get less until they disappear altogether, and the tubes get less numerous until one only is left.

When an apple is cut across the middle, ten green spots are to be observed arranged in a circle about midway between the centre and the skin. These are the ten main fibro-vascular bundles of the apple, one bundle being opposite to each of the five seed-cavities, and another bundle intermediate between each of those five. From each of these ten main bundles innumerable branches arise. "The earliest branching and the most direct course is towards the carpels (core) and the seeds; then the flesh is supplied by numerous diverging branches, which unite to form a network of vessels, and finally terminate beneath the skin in a perfect maze of the most delicate forked veinlets. So richly is the apple supplied with a connected system of vascular bundles that it would be difficult to find an area of any size without them."*

If we now picture this system, we shall see that, if all the flesh of the apple were removed, we should still have a complete model of the apple represented by these ever-branching and ever-uniting minute tubes—a complete model of an apple made up, as it were, of such a substance as the Egyptian Loofah (used for the bath), only of much finer material (Fig. 11). If we further picture the development of the apple, a fruit the development of which is very rapid, we shall see the sap travelling throughout this delicate network, not to any particular spot, but to every part of the swelling fruit. A supply of sap must be available for every cell of the living tissue where growth is going on.

If a vascular bundle and its branches fail to develop properly in the normal position an irregular "crinkled" or "pig-faced" apple is the result. If the ten main vascular bundles develop normally, but some of their ultimate terminations beneath the skin do not attain proper development, then the cells in their immediate neighbourhood will fail for want of nourishment—they will collapse—and the apple will become smitten with "Bitter Pit."

Bitter Pit is most liable to occur when there is an excess or deficiency of moisture at a critical period of growth. "When there is excessive moisture, and the enlargement of the pulp cells is too rapid to allow the

* McAlpine. Bitter Pit Investigation. First Progress Report, 1911-12.

vascular net to be formed regularly, then, whenever the supply fails, the cells will ultimately collapse and die. But when there is insufficient moisture to enable the conducting tissue to supply all the cells towards the periphery, then a similar result will follow."*

The principal factors which contribute to the development of Bitter Pit appear to be—(1) intermittent weather conditions when the fruit is at a critical period of growth; (2) amount and rapidity of transpiration; (3) excessive transpiration during the day, followed by sudden check at night, when the roots are still active, owing to the heat of the soil; (4) failure of supplies at the periphery of the fruit, followed by spasmodic and irregular recovery; (5) inequality of growth, so that the vascular network controlling the distribution of nutritive material is not regularly formed; (6) fluctuations of temperature when the fruit is in store; (7) nature of the variety. Agencies to which Bitter Pit has been ascribed, but which seem in point of fact to have no connection with it, are—(1) insects, (2) fungi, (3) bacteria, (4) external agencies (such as hail), (5) various sprays.

Hail-marks are generally indicated by being on one side of the fruit only, by the skin being broken at least in some spots, and there are often elongated markings without any break, showing where the hail glanced off the skin.

The incidence of Bitter Pit upon apples grown in New South Wales may be classified as follows:—

Bad.—Cleopatra, Esopus Spitzenburg, Hoover, Northern Spy, Ribston Pippin.

Slight.—Adam's Pearmain, Cox's Orange Pippin, Jonathan, Lord Wolseley, Maiden's Blush, Nickajack, Rhode Island Greening, Rymer, Shepherd's Perfection, Winter Majetin.

Free.—Dunn's Seedling, London Pippin, Rokewood, Rome Beauty, Stone Pippin, Yates.

Yates is practically immune in all the States, while Cleopatra is especially liable to be pitted. The reason of this difference has not yet been determined fully, but it will probably be found to be connected with a difference in the diameter of the vascular bundles and the minute structure of the wood of the tree. For if Bitter Pit is caused by too great a variation in the supply of sap to the fruit, then anything that tends to reduce the amount of this variability will reduce the amount of Bitter Pit. Since the sap rises from the roots, the greater the number of minute tubes between them and the fruit, and the greater their length, the greater will be the internal friction. In other words, the smaller the diameter of the tubes and the greater their length, the greater the force will have to be to push the sap upwards. The amount of wood, therefore, between the roots and the fruits will act to some extent as a break on the rapidity of the movement of the sap. In this connection it may be pointed out that young and vigorous trees

* McAlpine. Bitter Pit Investigation. First Progress Report, 1911–12.

making rapid growth are liable to pit, that a light crop with abnormally large fruit is more liable to pit than a heavy crop of average-sized fruit equally distributed over the tree, and that there is least Bitter Pit in Cleopatra apples when the trees are unpruned.

The presence of a sufficient amount of wood between the roots and the fruits is not the only factor to be considered, for, since Bitter Pit is connected with the supply of sap, not only must the ingress of water be considered, but its egress also. The latter depends upon the amount of transpiration, and this upon the nature and amount of foliage and the nature of the skin of the apple itself. In the immune Yates apple, for example, factors making for the more equable conduction of the water in the tissues are the leaf-buds developing first, the slow growth, the late season of ripening, the size and shape of the fruit, and the thickness and toughness of the skin.

"Since a good crop of average-sized fruit well distributed over the trees is less liable to Bitter Pit than a light and scattered one of abnormally large fruit, whatever tends to increase the yield and to make it regular will also be in the direction of reducing Bitter Pit. A practical application of this has been made by surrounding the stem with a zinc band, tightly fastened and notched at the margins so as to allow for the expanded growth. It is known that a copious supply of crude sap from the root tends to stimulate wood-growth, while the 'elaborated sap' from the leafy branches tends to develop fruit buds, so that by modifying the plant food the yield may be considerably increased. Where the sap is thus controlled, so that there is a proper relation between the wood-growth and the fruit-growth, the fruit being regularly and properly nourished, an increase in the yield follows, but the effect on the development of Bitter Pit has to be tested."*

The effect of this process of girdling may still be seen in some of the old apple orchards in England, where an iron band was used. It checked the downward flow of sap, and a bulky swelling of the trunk took place immediately above the band. For a few years an increased crop was produced, but after that the roots, being deprived of the necessary amount of elaborated sap, failed to develop normally, and the trees began to flag. The practice was, therefore, discontinued.

In some quarters it has been stated that seedling stocks are unfavourable to Bitter Pit, but it has been found in actual practice that, with varieties liable to attack, every apple on the tree may be affected.

It is clear that Bitter Pit is, to a great extent, dependent on the weather, and this we cannot control. To diminish the amount of disease the following recommendations are made:—

1. Light pruning, taking care to admit light at the top.
2. Thinning not to be overdone.

* McAlpine. Bitter Pit Investigation. Second Progress Report, 1912-13.

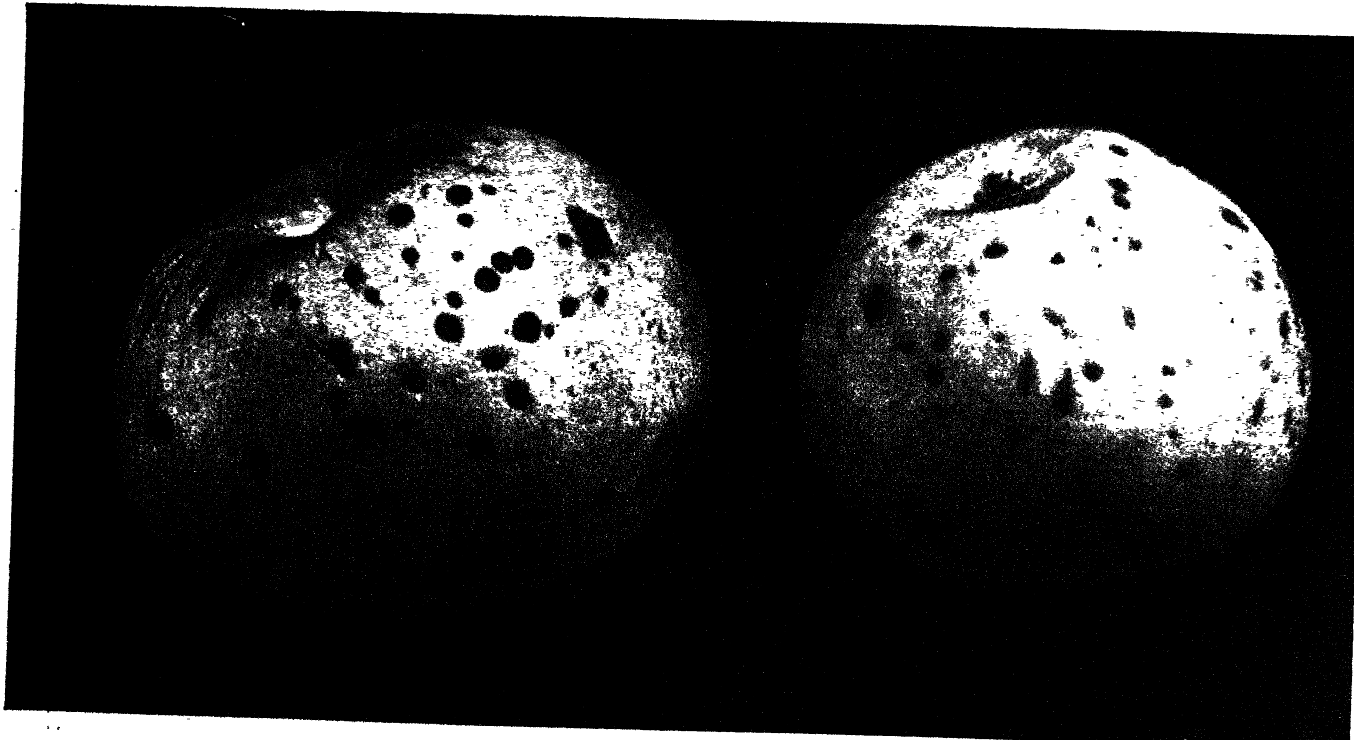


Fig. 10.—Bitter Pit on Apples.

The spots on the left fruit are sharply defined owing to the discolouration of the skin over them, while many of the spots on the right fruit are vague owing to the skin being still healthy. Part of the skin of the right fruit has been cut away to expose spots in the flesh. Both fruits are shown blossom end up. From photographs nearly natural size (*after C. P. Lounsbury*).

FUNGUS AND OTHER DISEASES OF THE APPLE.

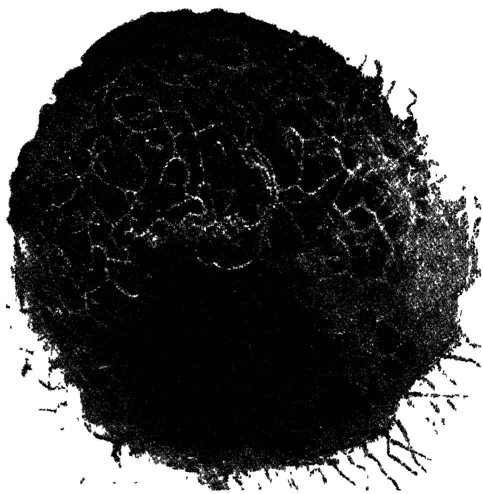


Fig. 11.—Vascular network of the Apple (*after McAlpine*).

Fig. 12.—London Pippin (Five Crown), front view of crinkles and cross section through same, showing the skin thrown into folds but still intact (*after McAlpine*).

3. Growth not to be stimulated in fits and starts (by manure or irrigation) in the growing period of the fruit.
4. Not to pluck the fruit too late.
5. Not to have the storeroom too dry.
6. To re-work—that is, to graft—a non-susceptible variety on the old stock.

Apples in storage frequently develop Bitter Pit. The general opinion is that Bitter Pit always originates in the fruit while on the tree, although it may take a considerable time to develop. But experiments carried out with apples in which no sign of Bitter Pit could be detected when picked have shown that Bitter Pit may develop in storage if the conditions of temperature and humidity fluctuate. The longer these fluctuations continue the deeper will the brown patches extend inwards. Bitter Pit is a functional disturbance of portions of the tissue, which disturbance in the stored apple is brought about by irregularities in the transpiration, and in the case of the growing apple by derangement of the vascular tissue in addition.

Cold storage experiments have conclusively proved that if apples are stored at a temperature of 30-32 degrees Fahr., under dry air conditions, the development of Bitter Pit is retarded. When, during the month of April, Cleopatra apples were removed from cold storage, both in Melbourne and London, they were found to remain marketable for at least a fortnight afterwards. With the proper linking up of cold storage from the vicinity of the orchard to the ship's hold the development of Bitter Pit in transit should be a thing of the past.

The factors influencing the development of Bitter Pit on the tree have been stated, and some indications given as to the direction in which the disease may be prevented or mitigated. The intimate relations of roots and shoots are well understood by orchardists. Considering the influence of the rise of sap upon the production of Bitter Pit, it may be found that some system of root pruning will aid considerably in its control. It may be pointed out here, for it is often overlooked, that the whole of the liquid nourishment taken from the soil by roots is absorbed by the root hairs, and that these occur only *immediately behind the growing points of the very youngest roots.* When a tree is transplanted, on account of the fineness of the absorbing rootlets and the ease with which they break, practically the whole of these rootlets are left in the ground—thus the whole of the absorbing root system becomes detached. In its new situation the tree has to start again to make a fresh system for the absorption of soil moisture. Hence the apparent paradox that transplanted trees that are dumped in anyhow may show as good development for the first year or two as those that are most carefully transplanted. Of course, in the long run, the tree whose roots have been carefully laid out obtains a firmer and better hold of the soil, and will be in a better position to withstand wind and to obtain nourishment.

Glassiness, or Water Core of the Apple.

This is also a disease due to internal causes, but its symptoms are quite distinct from those of Bitter Pit, and the two have only been found associated on rare occasions. It is most frequent in wet years, especially if the rain occurs about the time the fruit begins to ripen. Large varieties and early varieties are most subject to it. The appearance of an affected apple is very characteristic. Externally the portion affected has frequently a waxy or glassy appearance, and this never extends over the entire apple. Usually it is the upper half of the apple that is affected. The transparent, watery, glassy appearance may occur over large or small patches.

In cross section the hard, glassy areas are usually seen near the core, extending outwards from it, especially from the outer edge of the seed cavities. Sometimes small spots may be scattered through the flesh, and there may be extensive watery areas near the surface of the fruit, with normal flesh between them and the epidermis. From the description of the vascular system of the apple previously given it will be obvious that these areas must be in intimate connection with it, and glassiness possibly arises through some failure in the mechanism of the vascular tissue. Hair-like outgrowths from the carpels, giving rise to the so-called "tufted carpels," are frequently associated with glassiness. The cells composing glassy tissue are fully distended and turgid. The glassy portion has a sweetish insipid taste, and is deficient in natural flavour; when analysed it is found to contain an excess of water. The sound pulp of an apple consists of a number of more or less globular cells—resembling little bladders. Because they are globular the cells only touch each other at certain points, and there are interspersed among them a large number of more or less triangular spaces, just as in a heap of cannon balls a number of spaces are to be observed between the balls. In the sound apple, these spaces between the cells, or intercellular spaces, are filled with air, and give to the pulp of the apple its whitish appearance. In apples affected with glassiness these intercellular spaces have become filled with water instead of air, and so the whole tissue becomes semi-transparent.

Fruits affected with this trouble are not only deficient in flavour, but they do not keep as well as sound specimens off the same tree. On account of the excess of water the internal diseased portions soon decay, and even the skin, which is remarkably thick over the glassy portion, soon decays and turns brown. Why the watery cell sap in a glassy apple gets into the intercellular spaces we do not know. We do not even know why in a healthy apple it does not always do so. The explanation of Pole Evans, that "the cell sap fills the cells to overflowing, but, instead of bursting them, quietly diffuses through their membranes or walls, and then accumulates in the intercellular spaces," may or may not be correct.

J. S. B. Norton* considers that the occurrence of glassiness under conditions favouring excessive sap pressure or turgor, on vigorous trees, or trees

* Phytopathology, Vol. I, No. 4.

with the foliage reduced by blight, and especially in late summer when the air is cold at night and the soil warm, the cracks in the carpels, the occurrence along the vascular tissue, the liquid filling the intercellular spaces, all lead to the conclusion that the trouble is due to sap forced into the seed cavities and intercellular spaces by excessive sap pressure under conditions of reduced transpiration. The air being excluded from the inner cells by the liquid filling the intercellular spaces, respiration in the absence of air, or anærobic respiration, may be increased, and may account for the alcoholic flavour, if not for the decrease in acid and the sweeter taste.

No cure for glassiness has at present been suggested.

Mouldy Core of Apple.

In some varieties of apple there exists a small channel between the eye end and the interior of the core. This channel remains permanently open in the centre of the eye, and into it spores of various fungi may get blown by the wind, and once inside the apple they germinate and give rise to mould, usually white in colour. It soon spreads and causes the entire apple to become rotten. Varieties such as Cleopatra, Annie Elizabeth, London Pippin (Five Crown), which have this opening at the blossom end, leaving a passage to the core, are particularly liable to an attack of mouldy core, and their keeping qualities suffer in consequence. It is found that the possession of an open channel to the core cavity is not an absolutely constant character; the average diameter of the channel may vary much in the same variety, or the variety may show an open channel when grown in one district and a closed channel when grown in another.

(To be continued.)

New South Wales Wheat-growers at the Victorian Royal Show, 1914.

In a note in the *Journal of Agriculture, Victoria*, Mr. A. E. V. Richardson, M.A., B.Sc., Agricultural Superintendent, refers to the wheats exhibited at the Royal Show. It is significant that of the five main awards in the various classes, four should be won by progressive wheat-growers of our own State

The prize for High Strength White was won by Mr. William Tonkin, of Delungra, with a fine sample of Comeback; the second award going to Mr. W. H. Scholz, of Gilgandra, with a sample of the same variety.

In the High Strength White Class, the first prize was awarded to Mr. W. H. Scholz, of Gilgandra, with a magnificent sample of Cedar, while the second prize was won by Mr. W. Tonkin.

In the Low Strength Class, Bunyip, grown by Mr. W. Tonkin, was the winning exhibit.

The Champion Prize was awarded to Mr. W. Tonkin, for his entry of Comeback.

The Construction of Poultry Buildings.

[Continued from Vol. XXV, p. 1078.]

JAMES HADLINGTON, Poultry Expert.

A Combined Roosting and Scratching Shed.

THE plan shown is that of a pair of poultry houses on the combined roosting and scratching shed, or "semi-intensive" principle, which were built to the design of the writer for the "Housing Experiment" at the Hawkesbury Agricultural College. It will probably be remembered that half this house has been run under the "intensive" system, *i.e.*, the birds are confined to the house, while the other has been run as "semi-intensive," *i.e.*, the birds are free to run outside. There are 100 in each flock. The plan is suitable for either system, but the intensive is not recommended. The portion run as "semi-intensive" has proved highly satisfactory, so much so that the egg-yield from the 100 hens run in one flock has been within three eggs per hen of the average for the pens of six hens in the general competition.

It has been an article of faith among poultry men, and one to which most of us have subscribed, that hens run in small flocks give the best results, and the smaller the better. This, no doubt, holds good under equal conditions, but these small flocks not only entail a vast amount of labour in attendance, but a much larger expenditure in construction and maintenance than is the case with flocks of 100 or more. If, by giving a better class of house, with provision for scratching material, we can get almost equal results, there is no question of its superiority. In fact, up-to-date poultry-farmers everywhere are recognising that the small flock system has been over-rated, and are reverting to the larger flocks running from 100 to 250 in each.

The plan provides for a shed capable of housing 200, or with the division in the centre of the length to stand at the intersection of two runs, 100 in each. All measurements are worked out on this basis, but should it be desired to use this plan as an "intensive" house, the size will need to be increased to 60 feet by 14 feet at least, or the number run in it reduced to 75 instead of each 100 as provided for in the plan. Scratching material can consist of straw or litter, bush leaves, or horse stable manure, which is found very successful. The litter or horse manure would only need renewing about once in four months if kept dry, and therefore is no great expense.

Cheapening Construction.

A way of cheapening construction to some extent would be to substitute kerosene tins, with the sides cut out, for nest boxes. These would be placed along the front, but inside the house instead of outside, as per plan. Plain galvanized iron can be used up to and 18 inches above the nest boxes

in place of the weatherboards, and the method of access to the nest boxes in this case would be by holes, about 8 inches in diameter, cut into the iron, opposite each two nest boxes. These holes can be covered with a disc of the same material, which is pivoted upon a bolt and swung up to give access to the nests for the purpose of gathering eggs. The nest boxes are supported in position by two 3 inch x 1 inch battens, one running along the length of the iron and another along the front. Another may form the platform on which the hens alight to enter the nest. An iron pipe would be even better than the batten, but would be more expensive.

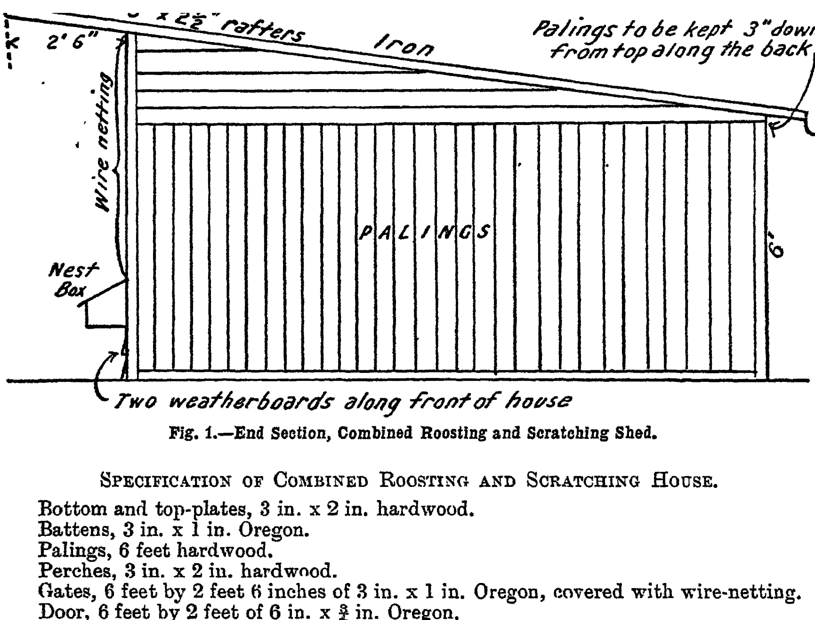


Fig. 1.—End Section, Combined Roosting and Scratching Shed.

SPECIFICATION OF COMBINED ROOSTING AND SCRATCHING HOUSE.

Bottom and top-plates, 3 in. x 2 in. hardwood.
Battens, 3 in. x 1 in. Oregon.
Palings, 6 feet hardwood.
Perches, 3 in. x 2 in. hardwood.
Gates, 6 feet by 2 feet 6 inches of 3 in. x 1 in. Oregon, covered with wire-netting.
Door, 6 feet by 2 feet of 6 in. x ⅜ in. Oregon.
Size of building, 44 feet by 14 feet—7 feet 6 inches high off the floor in front, and 6 feet at back.
Front of house covered with 1 in. wire-netting, with two weatherboards along the bottom.
Back and ends of house covered with lap and space palings.
Division.—A 12 in. x 1 in. pine board along bottom from end to end.
Floor filled up to within 1½ inches of top of bottom plate, and finished off with cement at least 1½ inches thick.
Roof, rafters, 4 in. x 2½ in., spaced 4 feet apart.
Eaves to project 2 feet 6 inches in front, and 6 inches at back, with 4½ in. guttering.
Covered with three 6 feet sheets of 26 gauge galvanized corrugated iron.

It should be noted that in this plan the roosts occupy the back portion, say, 6 feet, of the house. Three or four perches can be used. This portion of the floor is simply sanded or sprinkled with dry earth, while the open space front portion of the house which is divided on the floor from the roosting portion, is the scratching section. To get the full benefit of the scratching principle the evening feed should be thrown on to the litter between 2 and 3 o'clock in the afternoon so that the birds have the longer time to scratch out the feed, thus giving the necessary exercise.

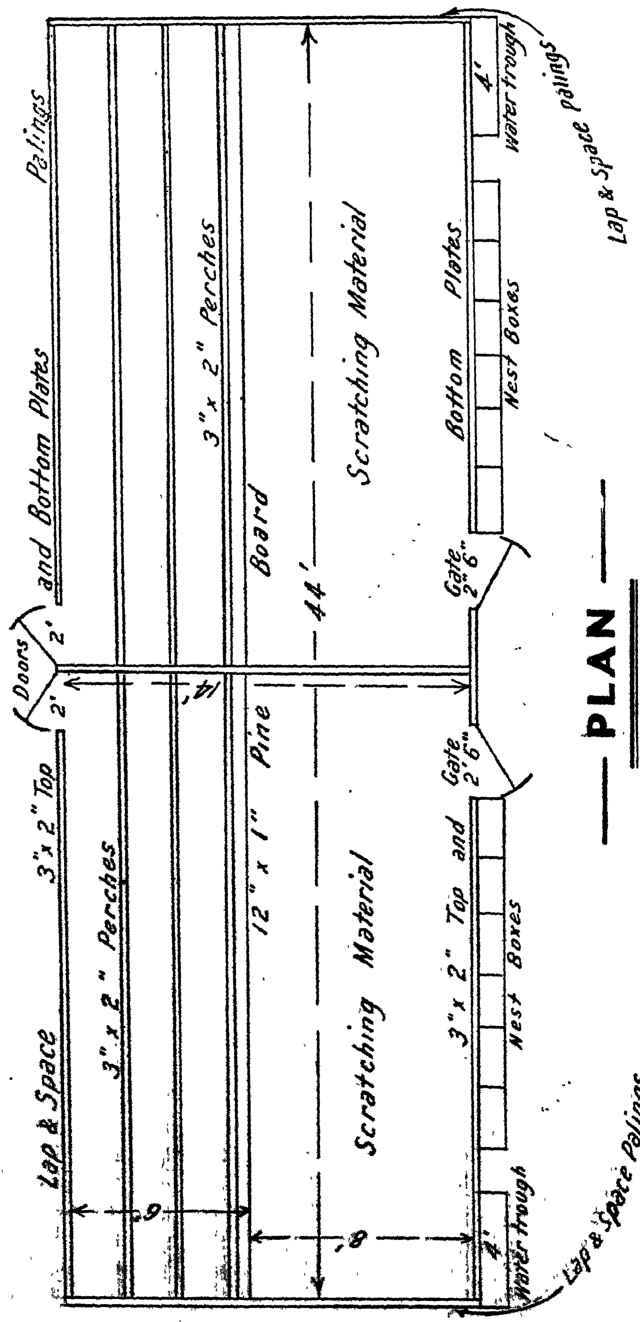


Fig. 2.—Combined Roosting and Scratching Shed.

It may be laid down as a general principle that when poultry, particularly laying hens, have to be confined to small bare yards, scratching material of some kind is necessary to secure the best results, and that to make provision for scratching material a house with a floor space nearly double that of the house for roosting room only is necessary.

This plan of house can be run with or without a grass run or open range. If grass runs are decided upon, it will be necessary to allow (as previously stated) 175 square feet per hen, which equals an acre for 250, while if bare runs are used, 50 to 60 square feet per hen will be sufficient.

It may be stated that iron can be used for walls in place of the palings if the iron is painted. Excessive heat is the only objection to iron. The latter has the advantage of being practically vermin-proof. The materials for yards can be of the same class as advised in previous article on the smaller yard construction.

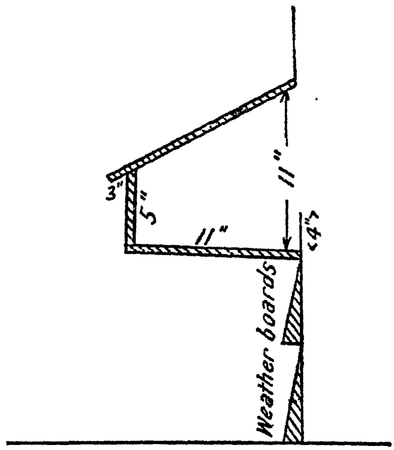


Fig. 3.—Section of Nest Box, Combined Roosting and Scratching Shed.

A Second Plan.

The next class of house (Figs. 4, 5, and 6) is designed to accommodate fifty hens without provision for scratching, and is built of the same materials as the previous structure, viz, walls of sawn palings on the lap and space principle with iron roof; or it may be built of iron or weatherboard, but either of these materials will be more expensive than the design, particularly the weatherboard, because of the extra studding needed. This house has a floor space of 15 feet long, 6 feet 3 inches wide, is 5 feet high at back, and 6 feet at front. It is formed of three walls—back and the two ends—with an open front, which, however, should be covered with wire-netting, and is all the better if a door is arranged for, in addition to that at the back. This enables the attendant to shut up his birds when required for manipulation, and is most convenient, while adding but little to the cost.

This class of house is suitable for large grass runs, or for free range use on the colony plan. One point that should be referred to is, that where enclosures are used at all, the houses should be arranged along the lines, so that all work—gathering of eggs and general attendance upon the birds—can be done from the lines.

This class of house can be lengthened to suit any given number of birds up to, say, 250. As an example, it might be stated, that to accommodate 100 it will require to be extended to 30 feet, and to double this length when required to accommodate 200 to 250, according to the size of the birds. In

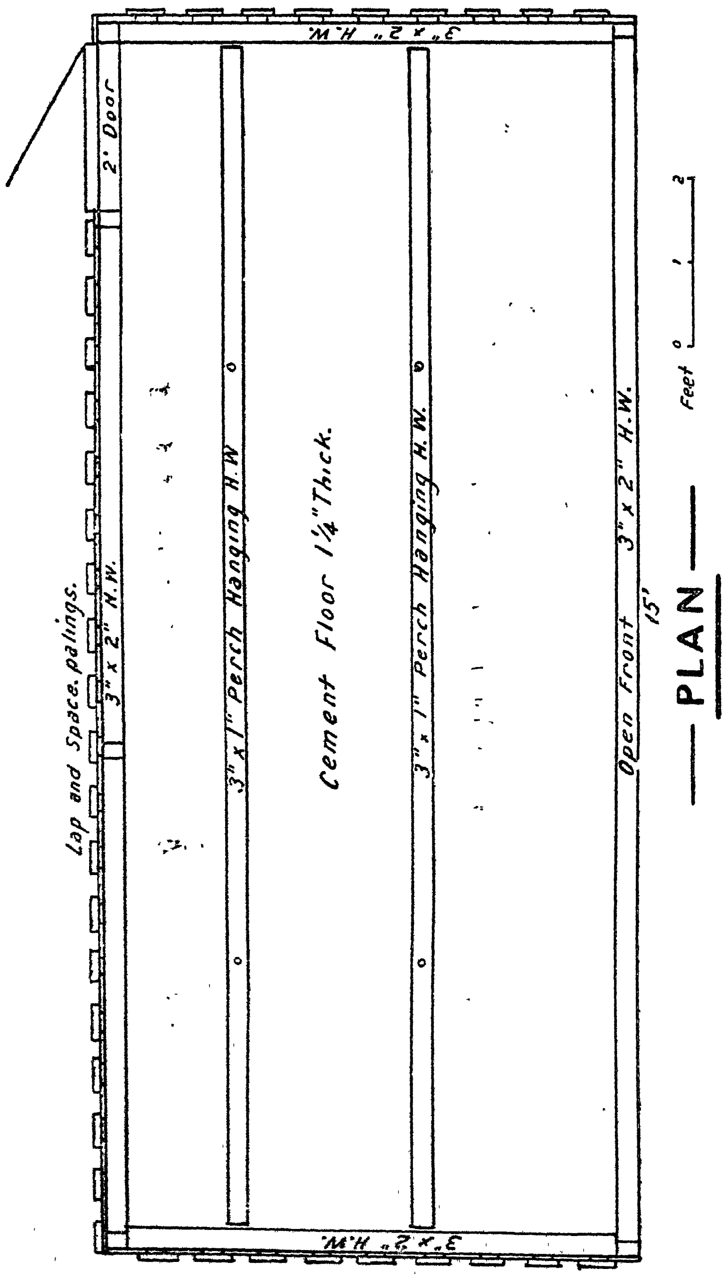
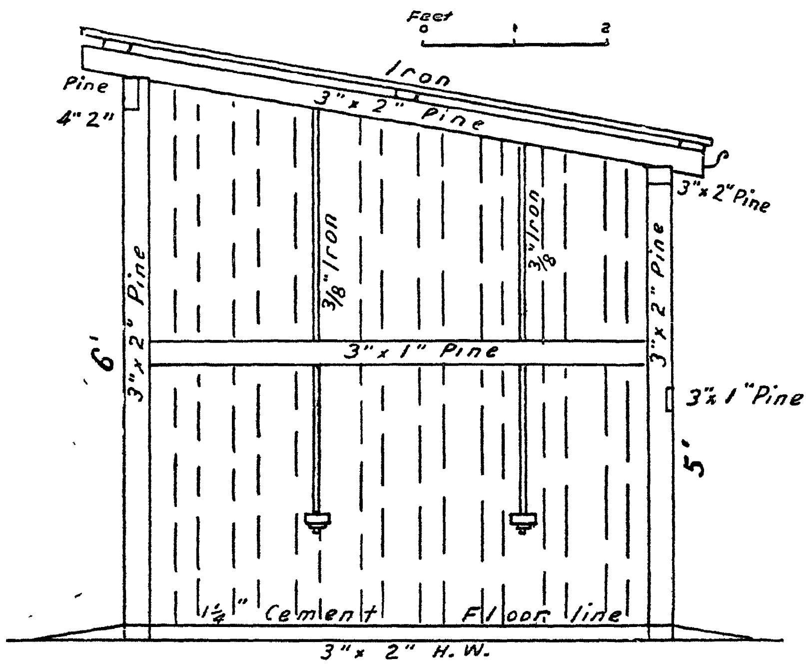


Fig. 4.—Open-fronted Poultry House to accommodate fifty birds.

the case of extension to 60 feet, it is advisable to put in at least two partitions as "break-draughts," thus forming what may be termed roosting sections. The idea of this is to prevent the wind gathering in at one end and sweeping the whole house. Nests can be placed either along the front, in the same manner as in the plan previously described, or, if more convenient for gathering, along the back of the roosting quarters. In this case, the use of kerosene tins or other metal nests would be advisable.

In the next article it is proposed to deal principally with the method adopted in the colony system, on free range, and the use of movable yards.



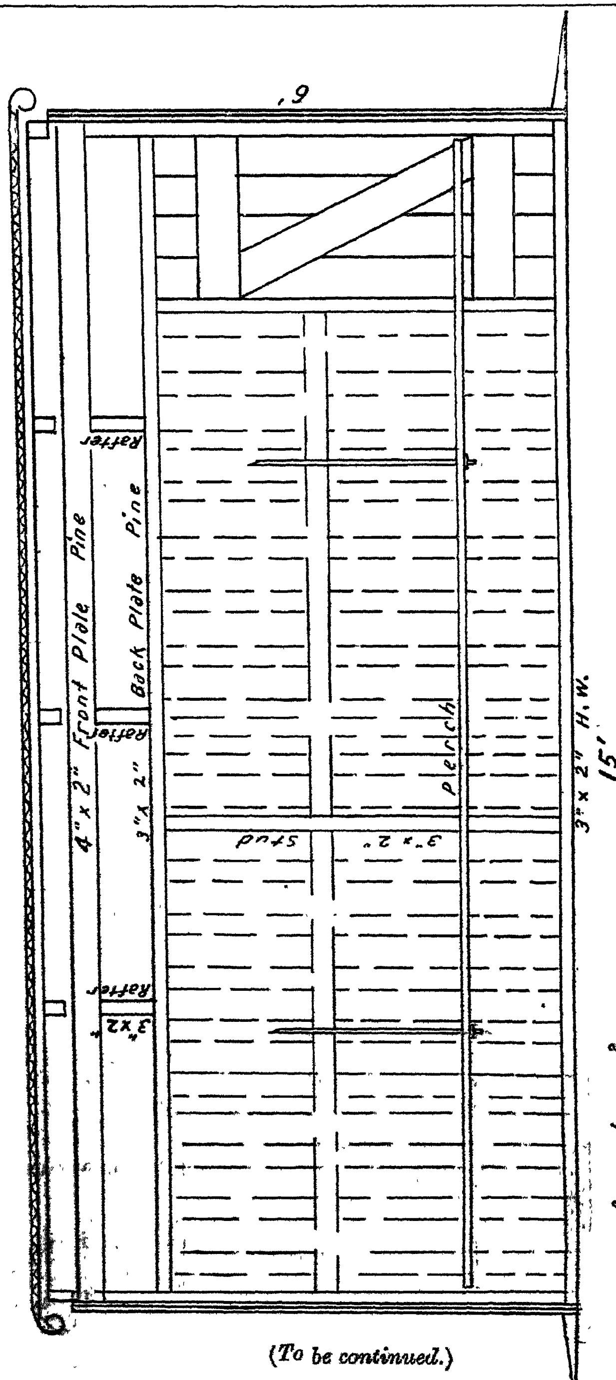
— END SECTION —

Fig. 5.—Open-fronted Poultry House.

SPECIFICATION OF OPEN-FRONT POULTRY HOUSE TO ACCOMMODATE FIFTY BIRDS.

Floor ...	... Concrete, 1 inch thick, with ¼ inch cement facing, flush with top of plate.
Bottom Plates	... 3 in. x 2 in. hardwood, well oiled.
Top Plates	... 3 in. x 2 in. Oregon back, and 4 in. x 2 in. Oregon front, on edge.
Studs ...	... 3 in. x 2 in. Oregon, tenoned into plates.
Rafters ...	... 3 in. x 2 in. Oregon.
Battens ...	... 3 in. x 1 in. Oregon.
Palings ..	... Back and ends of house lap-and-space palings—lap not less than 1 inch.
Door ...	... At back, 2 feet wide, made of 6 in. x ¾ in. Baltic.
Roof ...	... Covered with 26 gauge galvanized corrugated iron.
Perches ...	... 3 in. x 1 in. hardwood, suspended from roof with ⅜ inch iron rods.

Bank up with earth round outside of house to the top of bottom plate.



FRONT ELEVATION

Fig. 6.—Open-fronted Poultry House to accommodate fifty birds.

(*To be continued.*)

Poultry Notes.

JAMES HADLINGTON.

JANUARY.

THE outlook for the New Year is perhaps not of the brightest for poultry-keepers, particularly the small man. Without wishing in any way to underrate the difficult position in which poultry-keepers find themselves in regard to high prices ruling for feed, and even obtaining feed supplies at all, it may be stated that the present position is unfortunately not without parallels in the past. More than once during the last twenty years wheat crops have been a partial failure, and the result has been to put prices up to similar levels to those now obtaining. Not only so, but experience points to the fact that similar conditions are likely to recur. Poultry-keepers cannot expect that the immediate effect of high feed values will be to raise the price of their products, but rather it is likely to have the opposite effect, especially in regard to market poultry, the price of which must tend downwards owing to the way in which everyone is thinning down their stock with the object of economising in the feed. At such times the markets are bound to assume the appearance of over-production, but in subsequent years enhanced prices should be the result of the reduction in the size of the flocks. It should be remembered that such periods of stress are not confined to the poultry industry, but have their parallel in almost every branch of production or manufacture, yet these enterprises go on all the same, and so will the poultry industry. The objects of these notes and the efforts of this Department generally are not to be considered as booming the poultry industry, but to give advice and guidance. The industry has proved quite attractive enough to the man of small means, but this is the operator who suffers most severely in any branch of business; a considerable set-back is to be expected in the poultry industry from the very inability of this class to feed their poultry, and to tide over a period of strain. The larger operators, who have been through similar experiences and have "weathered" the storm, know well enough that in the end the business will right itself.

Much uneasiness is also being felt amongst the less experienced on account of the unsaleableness of young late-hatched chickens. But if the advice tendered in these notes had been followed there would have been no late chickens available for sale. It may seem attractive to the beginner to keep hatching chickens long after it is profitable to do so; but to find buyers for this unremunerative class of stock is quite another matter, because people who have had experience with these late-hatched chickens are not likely to be found repeating it, more particularly in a time like the present with the prospects of dear feed. Therefore, operators who have

fallen into this error have only themselves to blame if they have to accept unremunerative prices.

To test the matter as to whether there is over-production of the right class of stuff let anyone essay to purchase a good class of young cockerel in our markets, each 4½ to 5½ months old and weighing as many pounds each, live weight, and I venture to say the result will be a very decided change of opinion. It is perhaps only in January and February that there is anything like sufficient of this quality offering to meet the demand, even at high prices.

Unfortunately, this annual flooding of the market, between November and February, with chickens not half grown, and mostly not half fed, and of the lighter breeds such as Leghorns, has become a chronic condition, and this is the only over-production that exists.

The way to overcome this unhealthy state of affairs, as already advised, is the discontinuance of late hatching, and for operators to hatch no more than they can afford to feed to the age and weight as indicated to suit the demand of the market.

The same thing applies to small lightweight hens, such as undersized Leghorns, Chinese Langshans, &c. There is little demand for such at any time; hens to realise good prices require to be fairly weighty, because they are mostly used for "boilers," and are of little use for this purpose unless a good cut can be made from the breast. This is an additional reason why lightweights should not be favoured as utility stock. As an instance of this, small sorts of hens have been selling as low as 2s. 6d. per pair, while heavier hens were making 4s. 6d. Even if it be admitted that lightweight hens are the heavier layers (which up to a certain point they are not), it will be seen that the lightweight hen must lay in the vicinity of a dozen eggs in the year more than her heavyweight rival to be equal in profit, not to mention the difference in the male proportion of her progeny, where the lightweight breed suffers considerably in comparison, and would probably mean another two dozen eggs to balance her deficiency. These are points in the business to which our poultry-keepers would do well to pay closer attention. It cannot be too often emphasised that poultry-farming to be profitable must be treated commercially in all its bearings.

The Co-operative purchase of Feed.

The methods usually adopted by the small operator in the matter of the purchase of feed constitute a handicap on his cost of production that is calculated to crush him in times of strain such as the present. By buying in small parcels he is in most cases paying 25 per cent. more for his feed than is the case with the large operator, who is purchasing his requirements in wholesale lots at a fraction above paper quotations.

As an instance of this, the writer has come in contact with instances where small parcels of pollard and bran were charged at the rate of 2s. per bushel, which works out at £10 per ton, while larger operators are known to be getting their supplies in the neighbourhood of £7 10s. per ton, which works

out at 1s. 6d. per bushel, and comparative prices for wheat and other grains. Here then is an object lesson for small poultry-farmers who find themselves in groups (there are many such within 50 miles of Sydney) where co-operative buying might be practised. If only they would organise for that purpose it would not only reduce the cost of feed, but lessen the difficulties in regard to supplies—a difficulty that has scarcely been encountered by larger buyers.

Market Conditions for Eggs.

Fluctuations in the price of eggs are almost a permanent feature of November and December, and this year is no exception to that rule. November found them ruling at 8¾d. per dozen at the commencement of the month to 1s. 2d. at the end, and during December so far they have fluctuated between 1s. and 1s. 4d. per dozen for "new laids." But when the average is struck it will be found that, considering the present conditions, prices compare very favourably with the same months of previous years, and the pessimists who a couple of months ago predicted that eggs would touch 6d. per dozen before Christmas should be very agreeably surprised; at any rate, it is satisfactory to find that, notwithstanding the many adverse conditions, prices are being maintained. It is no use to complain that they are not as high as they should be, to correspond with the high price of feed, because, as has already been shown, it is quite hopeless to expect that such can ever be the case.

Broomhall's Australasian Wheat Ready Reckoner.

Mr. L. F. Broomhall, the compiler and publisher of several ready reckoners and computing tables, has issued in a handy form a Ready Reckoner (Wheat Edition) showing at a glance the value at any price of either tons, cwt., qrs., and lb., or bushels of wheat. In addition, there is a quantity of useful, but not always easily available, information, as well as several other tables of interest and value to farmers. Published by L. F. Broomhall, Sydney. Price 3s. 6d.

Agricultural Bureau of New South Wales.

Season's Greetings to Members, 1914-1915.

It affords me great pleasure to take the opportunity of complimenting members of the numerous Branches of the Agricultural Bureau throughout the State on the operations of the past year. The number of Branches has again steadily increased, and now stands at 96, with an average membership of 33 per Branch.

Although it is realised that there is great scope for further progress in connection with this form of agricultural organisation, the decided success which has attended the efforts of members of the Bureau and the Field Officers of the Department of Agriculture is most gratifying.

On behalf of the Minister and the Officers of the Department, I have pleasure in wishing members of all Branches the Compliments of the Season, and sincerely hope that the year just commenced will be full of prosperity for the "Man on the Land."

George Valder

Under Secretary and
Director of Agriculture.

Sydney, 2nd January, 1915.

Agricultural Bureau of New South Wales.

NOTES COMPILED BY H. ROSS, Chief Inspector.

Branch.	Honorary Secretary.
Albury	Mr. J. Brenn, "Silvania," Racecourse Road, Albury.
Baan Baa	Mr. P. Gilbert, Baan Baa.
Balldale	Mr. H. Elrington, Balldale.
Bathurst	Mr. J. McIntyre, Orton Park.
Batlow	Mr. A. C. Arnot, Batlow.
Beckom	Mr. S. Stinson, Beckom.
Blacktown	Mr. Robert H. Lalor, P.O., Seven Hills.
Borambil	Mr. H. A. D. Crossman, "Homewood," Quirindi.
Bungalong	Mr. G. H. Pereira, "Springdale," Cowra Road, *viâ* Cowra.
Canadian	Mr. C. Smith, Canadian Lead.
Cardiff	Mr. John Cockburn, Cardiff.
Carlingford	Mr. D. K. Otton, Carlingford.
Cattai	Mr. A. J. McDonald, Cattai, Pitt Town.
Collie	Mr. C. J. Rowcliff.
Coonabarabran	Dr. F. G. Failes, Coonabarabran.
Coradgery	Mr. J. Clatworthy, Beechmore, Millpose, Parkes.
Coraki	Mr. G. E. Ardill, Bungawalbyn.
Coreen-Burraja	Mr. N. B. Alston, Coreen, *viâ* Corowa.
Courangra	Mr. S. H. Warland, Courangra, *viâ* Brooklyn.
Cowra	Mr. E. P. Todhunter, Cowra.
Crudine	Mr. F. W. Clarke, Crudine.
Cundletown	Mr. S. A. Levick, Roseneath, Cundletown.
Cundumbul and Eurimbla	Mr. J. D. Berney, Eurimbla, *via* Cumnock.
Deniliquin	Mr. W. J. Adams, jun., Deniliquin.
Derrain	Mr. A. P. Hunter, Red Bank Creek, Matong.
Dubbo	Mr. T. A. Nicholas, Dubbo.
Dunedoo	Mr. V. A. Florance (*pro tem*), Dunedoo.
Erudgere	Mr. Frank Hughes, Erudgere.
Fairfield West	Mr. J. H. Spargo, Hamilton Road, Fairfield.
Fernbrook	Mr. W. Marks, Yarrum Creek, Dorrigo.
Forest Creek	Mr. W. Thompson, Forest Creek, Frogmore.
Garra and Pinecliff ...	Mr. A. S. Blackwood, "Netherton," Garra, *viâ* Pinecliff.
Gerringong	Mr. J. Miller, Gerringong.
Grenfell	Mr. G. Cousins, Grenfell.
Gunning	Mr. E. H. Turner, Gunning.
Henty	Mr. H. W. Smith, Henty.
Hillston	Mr. M. Knechtli, Hillston.
Inverell	Mr. W. A. Kook, Rock Mount, Inverell.
Jerrara	Mr. A. O. Lane, Public School, Mullengrove, Wheeo.
Jindabyne	Mr. Sylvester Kennedy, Jindabyne.
Katoomba	Mr. C. Wooller, Oliva Park Farm, Katoomba.
Keepit, Manilla	Mr. J. B. Fitzgerald, Keepit, *viâ* Manilla.
Kellyville	Mr. Joseph Nutter, Kellyville.
Kenthurst	Mr. J. R. Jones, Kenthurst.
Lankey's Creek (Jingellic)	Mr. G. J. Nichols, P.O., Jingellic.
Leech's Gully	Mr. Cecil G. Chick, Tenterfield.
Leeton	Mr. C. Ledwidge, Farm 442, Leeton.
Little Plain	Mr. F. S. Stening, Little Plain, *viâ* Inverell.
Lower Portland	Mr. W. C. Gambrill, Lower Portland.
Mangrove Mountain ...	Mr. G. T. Hunt, Mangrove Mountain, *viâ* Gosford.
Martin's Creek	Mr. P. Laney, Martin's Creek, *viâ* Paterson.
Meadow Flat	Mr. F. J. Brown, "The Poplars," Meadow Flat, *viâ* Rydal.
Middle Dural	Mr. A. E. Best, "Elliceleigh," Middle Dural.
Milbrulong	Mr. O. Ludwig, Milbrulong.
Miller's Forest	Mr. A. J. O'Brien, Miller's Forest.
Mittagong	Mr. W. S. Cooke, "Fernmount," P.O., Alpine.
Moruya	Mr. P. Flynn, Moruya.
Narellan	Mr. G. J. Richardson, Narellan.
Narrandera	Mr. C. F. Pearce, Narrandera.

Branch.	Honorary Secretary.
Nelson's Plains	Mr. M. Cunningham, Nelson's Plains
New Italy	Mr. F. A. Morandini, New Italy.
Nimbin	Mr. J. T. Hutchinson, Nimbin.
Orangeville	Mr. C. Duck, Orangeville, The Oaks.
Orchard Hills (Penrith) ...	Mr. H. Basedow, Orchard Hills, *via* Penrith.
Parkesbourne	Mr. W. H. Weatherstone, Parkesbourne.
Peak Hill	Mr. A. B. Pettigrew, Peak Hill.
Penrose-Kareela	Mr. A. J. Bennett, "Brookvale," Kareela.
Ponto	Mr. A. D. Dunkley, Ponto.
Redbank	Mr. J. J. Cunningham, Redbank, Laggan.
Ringwood	Mr. Wm. Tait, Ringwood.
St. Mary's	Mr. W. Morris, Queen and Victoria Streets, St. Mary's.
Sackville	Mr. Arthur Manning, Sackville.
Sherwood	Mr. J. E. Davis, Sherwood.
Stockinbingal	Mr. J. Neville, Stockinbingal.
St. John's Park	Mr. J. C. Scott, St. John's Park.
Tallawang	Mr. G. Lincoln, junior, Tallawang.
Taralga	Mr. Dave Mullaney, Stonequarry, Taralga.
Tatham	Mr. J. J. Riley, Tatham.
Temora	Mr. J. T. Warren, "Mortlake," Victoria-street, Temora.
Toronto	Mr. J. G. Desreaux, Esmond, Toronto.
Tumbarumba	Mr. R. Livingstone, Tumbarumba.
United Peel River (Woolomin).	Mr. C. E. Burke, Woolomin.
Upper Belmore River ..	Mr. A. W. Fowler, Upper Belmore River, *viâ* Gladstone, Macleay River.
Uralla	Mr. E. A. Neil, Uralla.
Valla	Mr. A. E. T. Reynolds, Valla, *viâ* Bowraville.
Wagga	Mr. Thos. Fraser, Aberfeldie, Wagga.
Walla Walla	Mr. H. Smith, Walla Walla.
Wallendbeen	Mr. W. J. Cartwright, Wallendbeen.
Walli	Mr. Geo. Edgerton, Applewood, Walli.
Wetherill Park	Mr. L. Rainbow, Wetherill Park.
Wollun	Mr. Robert Turner, Wollun.
Wolseley Park	Mr. H. McEachern, Wolseley Park.
Wyan	Mr. C. W. Harper, Myrtle Creek Railway Station.
Wyong	Mr. Edgar J. Johns, Wyong.
Yass	Mr. Cyril Ferris, Yass.
Yurrunga and Avoca ...	Mr. W. H. Waters, Yurrunga.

Notice to Honorary Secretaries.

It is important that a record of the meetings of the branches should be inserted in the *Agricultural Gazette*, and honorary secretaries are invited to forward to the Department a short account of the proceedings of each meeting, with a brief summary of any paper which may have been read, and the discussion that followed it, as early as possible after each meeting. Notes for insertion in the *Agricultural Gazette* must reach the Department before the 16th to ensure insertion in the following month's issue.

Insect Pests.—Quite a number of the branches have availed themselves of the Department's offer to supply a set of insects, being the common pests of the district, and the collections are now being cased. The Government Entomologist suggests that as each district has certain pests peculiar to its orchards and gardens, more useful work would be done if the members themselves collected the local pests (orchard, garden, and stock) and sent them to the Department, where they would be arranged, mounted, a descriptive label attached, and returned to the branch. Mr. Froggatt considers that such a collection would have a far greater value, as there would be more interest attached to the specimens when the members knew exactly where the pests came from, and where and how to find them.

REPORTS AND NOTICES FROM BRANCHES.

Batlow.

A paper on potato growing, by Messrs. Dodds and E. Quarmby, was read at the meeting of this branch on 1st November.

Potato Growing.

The writers maintained the importance of securing a good free loam, and if it could be watered by one of the races which abounded in the district, so much the better. In any case, thorough cultivation was necessary. Two winter ploughings and thorough scarifying had been found to pay well. A good plan was to grow a green manure crop and plough it in.

A complete artificial fertiliser should be used at planting time, and as a top dressing. Harrowing the ground after planting was beneficial, and inter-cultivation and hilling were insisted upon.

Great stress was laid on the proper selection of seed. This should be obtained by selecting the best stalks of the preceding crop, and keeping all the potatoes, big and small. Queen of the Valley, Up to Date, Burbank, and Batlow Beauty had all proved prolific under field treatment, as had also Coronation and Surprise, in the local experiment plots. Brownell's Beauty and Satisfaction, the two main varieties of a few years back, had begun to show signs of deterioration. Seed should be greened before planting. In dry weather larger seed, and preferably whole seed, should be planted. Seed should be changed from year to year, and benefit would also be derived from changing the paddocks. While the crop was growing, the farmer should go round and pull out all plants that were run out or not true to type.

Blacktown.

A branch has been formed at Blacktown, with twenty-two members to commence, and the following office-bearers have been elected:—Chairman, Mr. James Burns; Vice-Chairman, Mr. George A. Lalor; Treasurer, Mr. James A. Sayer; Hon. Secretary, Mr. Robert H. Lalor.

Meetings will be held the first Tuesday in each month, and the membership fee has been fixed at 2s. 6d. per annum. Subjects for discussion will be decided upon at the January meeting. There is every prospect of an increase in the membership at an early date.

Borambil.

The monthly meeting was held on 2nd December, at which members discussed the effects of the drought in the district. It was stated that in most instances sufficient wheat was not stripped for seed, the average being about 1 or 2 bushels per acre; only in odd instances were the crops better than that.

Before the close of the meeting, it was decided that the annual reunion should take the form of a basket picnic, followed by a social in the evening.

Cardiff.

The Secretary reports that interest on the part of members is not lacking, and meetings are being held every month. He furnishes the following resumé on a subject that was discussed at the October meeting:—

The Failure of the Fruit Crop.

According to old residents the summer of 1913 was the driest experienced here, and accordingly the fruit crop, *i.e.*, peaches and plums, was light. The

citrus trees also dropped nearly all their fruit. In February all the trees wore a very distressed appearance, but in March heavy rain fell, and from thence on there was plenty of moisture and very mild temperatures, so mild, in fact, that up to July peach trees were in leaf. Peaches are the main crop, owing largely to the proximity to Newcastle. The trees started to grow vigorously after rain fell in March, and continued to do so right into July; in fact, some trees were pruned with leaves on. In March the trees, mostly plum and apple, with some peaches, came into blossom. In the spring the conditions seemed ideal; any amount of fruit spurs and buds, and the trees blossomed heavily. Some had set their fruit and others were still flowering when a week's cold rain occurred and affected the trees so badly that some peaches dropped all their fruit. Application being made to the Department for information, and some specimens of fruiting wood forwarded, a reply was received stating that the wood had been examined by the Biologist, and he reported:—"No fungus or bacterial disease was detected upon the specimens. The failure of peaches (particularly early varieties) to unfold their buds, or having done so, to set their fruit, depends upon a variety of climatic conditions. In trees that are properly irrigated this failure is not so manifest. Where heavy rain follows upon the blossoming period failure to set the fruit is liable to be very marked, possibly through the minute root fibres becoming waterlogged. On account of the frequent failure of early peaches to set their bloom, the practice of some is to postpone pruning until after the blossoms have set."

Another noticeable feature was that the extremities of the young wood seemed to hang back, putting forth no leaves, and perhaps one or two buds would blossom and set their fruit, and there were young peaches on the young wood and no leaves. At the time of writing the peaches and plums have a brown fungus upon them, especially on the under side of the trees where the fruit is shaded by foliage. The trees have made an extraordinary growth of foliage.

The following office-bearers have been elected for the ensuing year:—Chairman, Mr. James Minslow; Vice-Chairman, Mr. George Warren; Treasurer, Mr. Charles Spooner; Hon. Secretary, Mr. John Cockburn.

The balance-sheet for the past year shows the handsome credit of £10 11s. 3d.

Collie.

A demonstration of the use of explosives in agriculture was given at Collie on 11th November, when there was an attendance of about seventy, including many members of the Bureau, several ladies, and a batch of senior pupils of the local school. The demonstration was conducted by Mr. H. Rogers, Assistant Inspector.

The Use of Explosives.

Mr. Rogers first operated on a stump of about 20 inches in diameter. The charge was well judged and nicely placed, and resulted in the stump and all roots being removed, leaving the smallest possible hole. One of the spectators, who seemed to have doubts on the subject, was asked to select the next tree. He picked on a solid box, about 2 feet through, and was pleased to see the satisfactory result of the explosion. This tree, together with all its roots, was removed at a cost of about 2s. 3d. Mr. Rogers demonstrated in a practical manner how good results could always be obtained in clearing work by placing the charges in such a position as to produce the maximum efficiency. The gelignite was handled and discussed in such a manner as to show that it would do the work in question both economically and well. The use of detonators was explained, and those present cautioned regarding carelessness in the handling of them. Their composition was of such a sensitive nature that a pin prick would often explode it, and as each plug was capable of shattering a person's hand there was every need to exercise great care in the handling of them, small though they were.

A demonstration in subsoiling was also given, and the reasons and methods explained. It was pointed out that for orchard work explosives are better

than the ordinary subsoiler, it being possible to place the charges where desired and to shatter the subsoil without damaging the trees. Time could also be saved in digging post holes and excavations.

The necessary outfit, viz., earth-auger, wood, bar, rammer, firing cable, and exploder can be purchased for from £5 to £7.

Cundumbul and Eurimbla.

A meeting of the Cundumbul and Eurimbla branch was held on 30th November. Several new members were enrolled, and the membership now totals twenty-eight.

Mr. W. R. Birks, Inspector of Agriculture, attended the meeting and delivered an address, in which he dealt chiefly with the various subjects the branch might consider, and also gave an outline of the methods best suited to its working. At the conclusion of the address many questions of interest to members were answered, and a vote of thanks was accorded Mr. Birks.

The following paper was read by Mr. F. J. Meurant:—

Fallowing and Rotation of Crops.

There are two kinds of fallow, the "short" or "summer" fallow, and the "long" or "winter" fallow. Short fallow means that as soon as the crop is harvested the farmer at once, or as soon as possible, puts the plough into the land, in order to get the benefit of all the summer rains, and then, as soon as he can get on to the land after the rain, he harrows it down, so as to conserve every drop of moisture. The weeds will then begin to start, and this is where sheep come in. Every farmer has a few sheep, and if turned on to the fallow land they will keep all weeds down, thus saving a lot of labour. Avoid putting sheep on to the ground if it is wet and boggy. If the surface begins to cake and get hard, put the cultivator on, and keep the fallow worked in this way till seed time.

The long fallow is, in principle, the same as the short fallow. As soon as seeding operations are finished, plough all spare land for fallow for next year's crop, and keep it cultivated as with the short fallow. By this method the land is kept in good condition to ensure the germination of the seed, and the probability of a good crop. I have never experienced a failure on land treated in this way; even this season, in this district, one farmer has a record crop grown on ground thus treated.

It is a great mistake to sow wheat after wheat on the same land, as the land gets what we would call "wheat sick," and the crop is rendered more liable to diseases, such as take-all. Take-all is very common in all wheat-growing districts. The wheat, after it comes into head, dies off in patches before the grain fills, there being no apparent cause. The real cause, in my opinion, is sowing wheat on the same land, year after year, and the only remedy is rotation of crops and fallowing.

Discussion.—Mr. A. McVicar did not consider it advantageous to plough stubble land when adopting the short fallow, but cultivating or discing, in his opinion, was better, as a larger area could be covered in a shorter time; also, weeds were more encouraged by ploughing.

With regard to continuous cropping, he stated that he did not favour wheat after wheat, but it did not cause take-all, though it might encourage it in land where it existed. He believed wheat should follow oats in land affected with the disease, as oats did not suffer from its ravages.

Mr. Birks explained that take-all is a fungus disease attacking the roots of the plants, and in order to combat it, fallowing must be done, so as to starve it out. The practice of sowing oats after wheat was a good one. It not only got over the take-all trouble, but was profitable as well.

Garra and Pinecliff.

At the annual meeting of this branch the following gentlemen were elected office-bearers for the ensuing year:—Chairman, Mr. S. Packham; Vice-Chairman, Mr. P. Rubie; Treasurer, Mr. S. Robards; Hon. Secretary, Mr. A. S. Blackwood.

The Secretary's annual report states that very satisfactory meetings of the branch were held during the year, and operations closed with twenty-eight financial members.

On 14th July last the departmental officer in charge of explosives work visited the district, and gave a lecture and demonstration on the use of explosives for clearing and subsoiling. After the demonstration twelve new members were enrolled.

Kareela.

At the monthly meeting of the above branch, held 26th November, it was decided that the members visit the orchard of Mr. T. Hewson at an early date to view the results of the spraying experiments which have been carried out there by the Department of Agriculture.

It was resolved to hold a picnic during the holiday season, as a means of making the branch better known.

Kellyville.

The Poultry Expert, Mr. J. Hadlington, delivered a lecture to members of this branch on 12th November, the subject being "Poultry as an Adjunct to Fruit-growing." This proved a great success. There were seventy residents present, and all appreciated the lecture very much.

Leech's Gully.

This branch met on 30th November. Mr. F. Ditzell, Assistant Inspector of Agriculture, who happened to be in the locality, was present, and at the request of the meeting reviewed briefly last year's results of the farmers' experiment plots in the district, drawing attention to the yields obtained from different varieties of maize and potatoes, and from different fertilisers that had been tried. Plots had been arranged for on two distinct farms in the district this year, and those who cared to inspect either of the plots would no doubt be welcomed at any time by the experimenters.

After the address, several of those present questioned Mr. Ditzell about various matters, the following summary indicating the drift of the discussion:—

A Discussion.

Question.—What would you advocate doing if there was a heavy fall of rain immediately after planting maize?

Answer.—There would be a poor germination if the ground was left as it was, and the crust would have to be broken. After planting the plots last year there was a heavy fall of rain, and the ground was harrowed. If the maize was not planted, long, heavy harrows could be used. In America, where the fields were large, it was universal to plant on the check system, and the crop could then be cultivated on all sides. There was a special machine for this, and several of them were in use in New South Wales. It was a big advantage with weeds.

Mr. D. B. WEIR explained that his planting last year received a heavy fall of rain on it, and he used heavy harrows, with the result that the crop came up better than he had ever seen before.

Question.—Do you advocate manure for corn for winter fodder, planted say in February or March?

Answer.—I would recommend a light dressing that would force growth much quicker.

Question.—Last year I had 3 acres of corn for cow fodder, all but six rows being manured. The manured portion grew 2 feet above the other, but after rain the wind blew the manured part down.

Answer.—Hilling would guard against that.

In reply to Mr. CHICK, Mr. Ditzell said deep planting did not necessarily mean deep rooting. It depended largely on the character of the soil as to what the depth of planting should be. In sandy loam the depth should be, say, 2½ inches or 3 inches if the land was dry on the surface. In the plots at Mr. Chick's they had planted 3 inches deep, and at Mr. Cowin's 2½ inches.

Question.—Would you recommend a thick sowing of cowpeas with maize?

Answer.—Drill sowing is the best, and 20 lb. of seed per acre is sufficient. In New England cowpeas had not grown well, but they should be tried more. They seem to grow better with sorghum than with maize. Cowpeas enrich the ground in nitrogen.

Question.—Is it not dangerous to feed stock on sorghum until it has reached a certain stage?

Answer.—Yes, until it has been killed by frost or has headed out.

Question.—Is it too late to plant potatoes now?

Answer.—No. I only planted the experiment plots to-day, though I did intend planting earlier. The first two weeks in November is the best time. In this district January and February are the best months for rain, and crops planted now benefit by those rains. They should not be planted deeper than 4 inches. It is an advantage also to the potato digger not to plant deep.

Mr. MANSFIELD gave his experience last year with planting in four different ways, the best results being obtained from a 5-inch planting.

Mr. DITZELL said there had been blight on New England during only one season, but if the good rains continued he would not be surprised to see some blight amongst the crops. On some parts of New England farmers were thinking of spraying as a preventive.

Little Plain.

The monthly meeting of this branch was held on 29th October. Potato culture under local conditions was discussed, Mr. Hobbs leading the discussion by giving an address concerning his methods and experience. He generally picked over his seed potatoes three times, in order to make certain that they were thoroughly sound and suitable for planting. He advocated ploughing the land no less than five times, so as to ensure having it clean and thoroughly friable, and he believed in planting whole sets, especially in the warmer weather, on account of the frequency of dry spells. His first sowing, a small one, was made in May, and then he kept on sowing until the end of December, as circumstances allowed. Hilling with a plough was done as soon as practicable, and the cultivator or scuffler used between the drills, when necessary, up to flowering stage.

Some of the members asked Mr. Hobbs questions relative to the subject, and several very profitable issues were thus opened up for discussion.

Middle Dural.

The monthly meeting of the above branch was held on 6th November, the Chairman, Mr. C. W. Roughley, presiding.

Mr. A. Boot opened the subject, advocating more propaganda work in the interests of the fruit-growing industry. Mr. Boot's remarks led to a considerable amount of discussion, and at the close of the meeting he consented to give an address at the next meeting on "Careful Handling and Marketing of Fruit."

The monthly meeting of the above branch was held on 4th December, a fair number of members being present, and several visitors. During the course of the evening two lengthy discussions took place, the first on the use of agricultural lime, and the second on several diseases affecting the present crop of Briggs' Red May peaches, and various apricots. The address by Mr. Boot on "the careful handling and marketing of fruit" had to be postponed till a future meeting.

Miller's Forest.

A new branch of the Bureau was established at Miller's Forest on 8th October last, the following gentlemen being elected office-bearers:—Chairman, Mr. J. Priddle; Vice-Chairmen, Messrs. J. Maloney and J. Cunningham; Treasurer, Mr. J. Broderick; Hon. Secretary, Mr. A. J. O'Brien.

At the monthly meeting on 8th December the attendance was very fair. The Chairman, Mr. J. Priddle, presided. Three new members were nominated.

Samples of maize sent by the Department were distributed. Mr. J. Priddle then delivered a very instructive address on horses and their treatment.

Mr. Priddle was accorded a hearty vote of thanks at the conclusion of the address.

Mittagong.

On 4th November the usual monthly meeting of this branch was held, and was well attended. Mr. A. E. Massy, M.R.C.V.S., delivered a lecture on "Conformation and Unsoundness in Horses," illustrated by lantern views, which proved very instructive.

Parkesbourne.

The following extracts are taken from a paper read by Mr. S. W. McAlister at the September meeting of the above branch:—

Selecting a Breed for a Poultry Farm.

Most people who go in for poultry do so not as a hobby, but for profit, as a special business, or as an adjunct to the other branches of the farm. We generally regard egg-producing qualities as of most importance; most people want fowls of reliable laying breeds, and the majority do not specially give their time to the breeding of table varieties.

In deciding to keep fowls in any number, many experienced men consider there is nothing like the thoroughbred for best results. Some may say thoroughbreds are delicate, hard to rear, poor layers, &c., but after practical experience these opinions will generally be found to be unfounded. In all classes of farm-life the trend is for the best thoroughbred stock of every kind, and so in poultry the first essential to success should be the thoroughbred fowl, whatever breed we take up. As to the second point, I consider there is no best breed for all purposes, or for that matter for any particular purpose. So, no matter what the object in view, the breeder has the choice of several breeds or varieties, all of which are about equal in profit-earning qualities—

which qualities can be improved and developed by skilful breeding. A breeder would be more likely to succeed by selecting a particular breed that experience has proved to be commercially profitable, rather than by changing about from one breed to another.

By visiting shows and breeders' yards, and considering carefully the selection of a breed and then sticking to it, a man will succeed as in any other business. for from what I have seen failure can almost always be traced to the owner rather than to the breed he keeps. I have noticed that the men who succeed in poultry-raising and as poultry fanciers, are men who give their birds the best of attention, regardless of the breed they keep.

The first question asked about fowls by the buyer, or amateur poultryman starting, is: "Which is the best laying breed?"

Anyone who has studied poultry at all, or handled even a few fowls intelligently, must come to the conclusion sooner or later that there is no best breed, and that there are good and bad layers in all breeds. To simplify the matter, for the purpose of this paper, I shall divide them into four classes:—

1. The Mediterranean and non-setting varieties, whose strong point is the production of large quantities of (usually) white eggs, and which are suitable for egg-farming alone, where table qualities are of no object whatever. Principal among these are the Leghorns, Minorcas, Anconas, Andalusians, Hamburghs, and Spanish. These varieties are called "Mediterranean" because Andalusia is a province of Spain, Leghorn and Ancona provinces of Italy, and Minorca, an island in the Mediterranean.
2. The second class is the generally useful fowl, suitable for combining egg-farming and table poultry-raising. Some of these are great layers, and can put on the table as attractive a carcase as anyone could desire. Under this heading come Langshans, Orpingtons, Plymouth Rocks, and Wyandottes.
3. In the third class we have the table bird, pure and simple, in which we include the Brahmas, Cochins, Dorking, and Game of all varieties.
4. The fourth class (or breeds not referred to in the previous three) might be called the fancy class, the birds being so rare or so over-developed in some particular feature as to be practically useless for commercial purposes, their breeding being confined to a few fanciers who have time and money to breed them for show purposes only. Amongst these are Polish, Sultans, Redcaps, and Bantams of all varieties.

In the Mediterranean varieties the main features are a large single comb, carried upon a deep lengthy head, upright in the males, but gracefully falling to one side in the females. The face is red, except in the Spanish, the ear-lobes (often wrongly called the "gills") pure white, and the wattles long and fine in texture. The neck is long and well docked, and the body broad with full and prominent breast. The wings are large, but carried tightly tucked up. The tail is long and flowing in the cock, and full and carried well up in the hens. A well-known fowl of this variety is the Ancona (or speckled Leghorn). These, in colour, are a lustrous beetle-greenish black with each feather tipped with white. They are alert and active, and great layers of large white eggs. They are great flyers and rather nervous; if confined, they require high fences or covered pens, but they will do well on a free run and will pick up most of their living. They are small eaters, and a very profitable fowl to keep. Medium-size weights, from 5 to 6 lb. for cocks.

Andalusians come next. They are of similar characteristics, but are larger and longer in the leg. They are also good flyers and very active. In colour they should be a rich black in the hackle and saddle, but in most other sections a clear silver-blue ground colour, each feather being laced on the edge with black. These birds are also great layers, averages of 200 per year being common, and eggs very large. Their great failing is the difficulty of breeding them true to colour.

Minorcas are like Andalusians, but rather larger, and should not be quite so "gamey" in appearance, being more compact. In colour they should be a rich glossy black. Their egg capacity is similar to Andalusians, and size but little greater. In breeding these for egg-production good judges now avoid the extreme length of leg often seen in show pens.

Spanish are similar in build again, and in all characteristics are very much the same. In colour they are the same as Black Minorca. They lay the largest egg of any breed in existence and (if bred with that object in view) plenty of them.

Leghorns are the best of egg-producing breeds. They are shorter of leg, more compact, and slightly smaller than the three breeds just described. They are great layers and foragers, the eggs being of a decent size and attractive appearance. White Leghorns are probably more largely kept for egg-production than any other breed we have. They are small eaters and good doers, and generally give satisfaction where kept, provided fences are high enough to keep them out of gardens, crops, &c., for they are great explorers. In weight they run from 5 to 7 lb. and have no pretensions to any table qualities, laying being their strong point. The White Leghorns are a beautiful snow white all over. The Brown Leghorn cock has a glossy black breast and tail, with hackles of orange red, striped with black; the hen's body is brown, closely pencilled with black. They are attractive in appearance and suit confined quarters. The Buff Leghorn is a rich even buff and very pretty. In the Black Leghorn the plumage is a rich blue-black, free from any foreign-coloured feathers. In this (Goulburn) climate I consider White Leghorns need housing in the winter.

To sum up the egg-producing breeds, Hamburghs appear to take first place for the production of rather small eggs at low cost. Leghorns will be most satisfactory for yielding plenty of good-sized, marketable eggs at a profit. Minorcas, Andalusians, and Spanish are best for giving extra large eggs in fair quantity, but at a greater cost per dozen.

Coming to general purpose fowls, or what I call combiners of laying and flesh-building, as a general rule we note that they are compact, longer in body, with more meat on the breast than the foregoing breeds, and as a rule are good producers of marketable eggs. The Langshan is a large, close-feathered black bird. It is rather long in the legs, which are slightly feathered. Show birds are now bred very long in the leg, and lose many of the good qualities of the breed, but the true Langshan is highly thought of by many breeders of dual purpose fowls. The flesh is a good flavour and the skin an excellent colour. There are Langshan records of more than 200 eggs a year, large and beautifully brown. In the results of the latest laying competition at Hawkesbury Agricultural College, twenty-four Langshan hens averaged 184 eggs per hen, and the value per hen was returned at 18s. 10d.

Next comes the Orpington. Since the tendency to length of leg in the Langshan has affected its utility and value so much, the Orpington has been taking its place. It is bred in several colours, viz., black, buff, and white. All varieties are large and cobbily built, with full breasts, and are great table birds and dress well, the buffs and whites, on account of their light-coloured feathers, dressing the cleanest. Cocks weigh 9 to 10 lb. and hens 7 to 8 lb. As layers they are the equal of any breed, and a pen has put up as many as 243 eggs per bird in competition in the State. Buff Orpingtons are a hardy fowl; they lay when others stop and, like Wyandottes, stand the cold weather well. They are better than White Leghorns in winter, when eggs are a better price. The young birds are fast growers and are fit to sell at four and a half months old. They are easy to rear, local breeders considering them the hardiest chickens they ever raised. The eggs also hatch well. In the latest laying competition, thirty-six Black Orpington hens averaged 168 eggs, and the value per hen was 17s. 1d.

Plymouth Rocks are another good all round fowl, but not quite so good as layers. An inclination to put on fat under heavy feeding prevents them making heavy yields. In colour they are "barred," white, and buff. For table purposes our experience is they are one of the best sorts, whether purebred or crossed with Indian game.

Sackville.

At a meeting of the above branch on 30th October, the following paper was read by Mr. A. C. Manning, the Hon. Secretary:—

THE CARE AND CULTURE OF THE ORCHARD.

If we want the best results from our orchards, careful cultivation and strict attention to the different pests the trees are subject to are essential. My

experience has been that on land like the Hawkesbury River flats cultivation to a fair depth is much better than shallow, though land in high positions could not be worked on the same principle. Some orchardists merely skim the soil when ploughing, as they say deeper cultivation destroys too many roots, but if they start to cultivate at a fair depth when the trees are first planted, the roots will be kept well below the surface and not a great many will be destroyed when the soil is stirred from time to time. Cultivation to a fair depth also conserves more moisture, whereas with shallow cultivation the roots are drawn towards the surface when showers occur after a dry spell, and the next cultivation may do a good deal of damage. In my opinion the soil cannot be moved too often to keep moisture in during the hot summer months, but it is not advisable to work on land that is wet, as the moisture will leave more quickly and the soil will set into hard, flinty lumps. During the hot summer it is better to use the spring-tooth cultivator or scuffler than the ordinary harrow. We cannot do without the harrow altogether, but I think too much harrowing forms a hard bottom and the soil will not retain the moisture so well.

In a good many orchards the trees are injured by careless workmen, sometimes being barked with the swingle-bars or chains, sometimes even by branches being broken off. This, apart from making the trees look "scraggy," does a great deal of harm that the tree may not get over for perhaps years. I would prefer to take a furrow or two less than bark the trees, even if it left more hand work. Nor are the injuries only done in the ploughing. Sometimes they are caused by a careless hoeman or a bad hand with the secateurs.

The drains are an important part in the orchard. If they are not kept clear the orchardist is likely to lose some of the trees by soakage. Some orchardists about here know this to their cost, as a good many trees died the last wet winter we had, whereas if the water could have soaked away quickly there would have been no loss.

The orchards on the river do not require to be manured so heavily as the high lands or poorer portions. I have had some experience of the St. Ives district, where, if a good deal of manure was not used, the quality of the fruit would be indifferent. We are not under the expense here that those orchardists are in the manuring line, but I think the extra expense of freight and commission is quite as great. I find it better to "break a tree" not too high from the ground, as the branches then shade the butts of the trees and keep the roots cooler than if the branches are high enough for a horse to walk under. There will perhaps be a little more hoe work with the former method, but I think the fruit being so much lower to pull will more than balance that.

Besides pruning, thinning out of a heavy crop will pay well, both in the price of the fruit and in the time spent in pulling. Grading also repays the grower, although there is very little of it done in many of the orchards in this district.

Spraying or fumigating is a most important matter, especially while the trees are young. If the spraying or fumigation is carried out thoroughly every year the pests can be kept in check. The borer in the roots of citrus trees is a pest that it is not easy to cope with. They start in the roots, or bore in just above ground, and tunnel down to the roots, and then work up the barrel of the tree. The codlin moth, I think, will be got rid of in time if all orchardists spray thoroughly. After spraying last year for moth, my quinces and apples were greatly improved as compared with any previous years. A matter that might receive greater attention is the condition of the implements used in the orchard. Every ploughman likes the plough to run free, and if he always had an oil-can handy and made use of it when he was finished I am sure it would save a lot of time, for when the mouldboard or share gets rusty it takes some time before it cleans and runs easily again. The same applies to all other implements that are used in the orchard.

St. John's Park.

In a lecture before the members of this branch on 21st November, Mr. J. Secombe referred to some useful and also to some injurious insects.

Mr. Secombe pointed out that the bee was the most important and useful of all insects, and described how the inmates of hives do their work. There

were honey-gatherers and pollen-gatherers; the flowers of plants and trees were fertilised by bees, and but for them seeds would not be produced by many plants, and quite a number of fruit trees would not bear fruit. The tongue of the bee was too short to extract honey from the red clover blossom, but the work is done by the bumble bee, and its usefulness was illustrated by mention of the fact that in New Zealand excellent crops of red clover were grown, but the seed had to be imported until bumble bees were introduced. Ladybirds and a number of insects allied to them were invaluable in the orchard on account of the war waged by them on aphis and scale insects. The differences between ladybird beetles and true ladybirds were carefully indicated.

In reply to questions, Mr. Secombe said that cleanliness in fowl houses was absolutely essential to keeping down vermin which breed in the excrement. Resin and soda wash is one of the cheapest sprays for black aphis on peach trees. Besides killing aphis, it coats the eggs with a material that prevents the young ones from hatching.

On 25th November, Mr. M. Blunno, Viticultural Expert, delivered a lecture before this branch on an important subject:—

RECONSTRUCTION OF VINEYARDS.

The soil in the district is generally of a clayey nature, very stiff in parts, sometimes poor, but in a number of instances medium loose and fairly rich. The latter are to be found in isolated patches called "creek soil," that is, of alluvial formation. Reconstruction of vineyards began in 1899, when the first resistant stocks were distributed by the Department. The kinds mostly supplied then were the Riparia Gloire de Montpellier, some Riparia Grand Glabre, Rupestris du Lot, Martin and Metallica, and the Riparia x Rupestris No. 3,306, 3,309, and 101[14].

All those are highly resistant to phylloxera, and at that time were the kinds generally in vogue in France and other parts of Europe. It is time that other kinds were spoken of and planted here and there, but a certain apprehension was felt by the great majority of experts as to their resistance to phylloxera. These included a number in which one of the parents had been a European vine. These were principally the Mourvèdre x Rupestris, No. 1,202; Aramon x Rupestris Ganzin, No. 1; Chasselas x Berlandieri, No. 41B; and the Cabernet x Rupestris, No. 33. Their resisting power is necessarily lower because one of the parents is non-resistant. They were created because pure species, such as Riparia, Rupestris, and Berlandieri, although highly resistant, were found wanting in several other qualities which are indispensable in a stock of really practical use. They lacked a more general adaptation to the large variety of soils that is suitable for vine-growing, and affinity to the European vines, which include so many kinds that will make, when grafted, strong, healthy plants, bearing satisfactory crops regularly. The Berlandieri had also the very great inconvenience of not easily striking root. Certainly the crossbreds of Riparia and Rupestris which are known by the numbers 3,306, 3,309, and 101[14], and which are as resistant to phylloxera as their parent plants, are an improvement; nevertheless some of the parent characteristics are still sufficiently manifest to limit their area considerably with regard to texture of soil and climatic conditions; whereas the M. x R., No. 1,202; the A. R. G., No. 1; the C. x B., No. 41B; the C. x R., No. 33, already named, have to a certain extent the ubiquity of the European vine, which adapts itself to almost any soil. They grow vigorously, have a thick stem on which a vigorous European vine, like the Late Sherry, so largely cultivated here, will graft well without much outgrowing the stock, and they bear well and regularly. Their only drawback is a lower degree of resistance to phylloxera, which was at first thought to be insufficient in countries with a warm climate. This is the reason why, although the Department had a number of mother-stocks of those sorts, I never ventured to send any cuttings out, but waited to see the results of our experience as well as that of other countries with a somewhat similar climate. When sufficient time had elapsed to lead us to believe that they were safe enough, and when our own local experience was corroborated by that of planters in the southern districts of Europe, we sent them out to growers, at

the same time increasing the area of mother-stocks of those kinds at the Viticultural Station at Howlong. The stocks referred to are sufficiently resistant to phylloxera for all practical purposes.

Some particular information may be given about each kind of stock more generally known.

The Riparia Gloire de Montpellier has so far given very satisfactory results in this country in loose ground or friable loam; its slender stem is an inconvenience, because the scion outgrows the stem, especially when a vigorous vine like the Late Sherry is grafted on it. The roots of the Riparia Gloire grow close to the surface, more so the roots of the Riparia Grand Glabre, which is one of the drawbacks of this stock, and which, although it has its partisans, is gradually going out of use. The R. x R. Nos. 3,306, 3,309, and 101[14] are three good stocks; the last seems to stand a long spell of dry weather better than the other two. They graft well with the varieties largely grown in the country, and bear good crops.

The Riparia x Cordifolia-Rupestris, No. 106, was at first considered specially adapted to heavy, sticky clay peculiar to so many places in this district; truly for the first three or four years they grew most vigorously, but their vigour abated afterwards. It is a good stock in which, however, the Riparia parent is much in evidence; therefore it should only be planted in soils of medium texture, and fairly rich.

The Solonis Robusta, another crossbred, is only fit for damp, low-lying soils, sour and brackish, in which no other stock would live, though in such soils it would be better not to plant vines at all.

The Riparia x Berlandieri 157[11] is a splendid stock, very resistant, very slow-growing for the first two or three years, but increasing in vigour till it becomes most vigorous; grafts well, is a steady cropper, and yields a crop of the highest quality. It adapts itself to heavy clay soils, and stands long spells of dry weather admirably.

The Mourvèdre x Rupestris is, as already stated, practically resistant to phylloxera, very vigorous, sometimes too vigorous, and the European vine grafted on it shows the tendency to grow too much wood and small crops. It is necessary when this occurs to leave a larger number of spurs, so as to let off an excess of sap and abate that exuberance. It is a stock eminently suited on which to graft the Late Sherry.

The Aramon x Rupestris Ganzin, No. 1, is also practically resistant to phylloxera, although its roots are very badly attacked; grafts well in the field, is vigorous, a good cropper, and the crop is of high quality. It adapts itself to heavy soils, and stands well in wet or dry seasons.

The Chasselas x Berlandieri, No. 41B, like the B. x R., No. 157[11], is a slow grower for the first two or three years, but its vigour increases afterwards. It is practically resistant, it adapts itself to fairly heavy soils, grafts well, bears well and regularly, and the crop is of the highest quality.

The Cabernet x Rupestris, No. 33, is a vigorous stock, also practically resistant, thrives in heavy ground, grafts well, and, like the M. x R. No. 1,202, is suitable for the Late Sherry. Of all crossbreds, this is the stock that withstands the highest percentage of lime in the soil.

The Aramon x Rupestris, No. 143, has its devotees among the few that have tried it in this country. The grapes ripen somewhat earlier. The vigour of this stock failed in rather heavy soil at Howlong Viticultural Station, but there the average rainfall is but 22 inches. I have seen new plantations of it near Ryde looking satisfactory in rather heavy clay. One grower not far from here, who has had it for nine years in a soil of medium texture, swears by it; another gentleman near Camden has had it for about the same period in a soil of sandy texture, and is also pleased with it. In Europe it is not considered a high-class stock, but that it will do in soils of loose or medium texture, and must have sufficient moisture in the ground.

The three Rupestris types, viz., R. du Lot, R. Metallica, and R. Martin, were among those distributed early in the period of reconstruction in this county. After the varied and sufficiently long experience we have had, I would not advise planting either R. Metallica or R. Martin. Although there are isolated instances in which the Metallica has given, and is giving, every satisfaction, as in a certain vineyard near Narellan, it has been abandoned everywhere.

As to the Rupestris du Lot, there seems to be little doubt that a coastal climate is not the most suited to it. In many places in this county it is doing well, but not too well in others.

Phylloxera-resistant vines are not only exacting in the matter of plant-food available, but they want sufficient of it to keep on bearing good crops. Consequently the practice of manuring the vineyard every year should never be neglected, and considering the large crops obtained from a small area, it is an unpardonable mistake to grudge the ground the necessary fertilisers. It is a noteworthy fact that the root system of the phylloxera-resistant stocks is not so developed as that of the ordinary vines; especially is there a scarcity of the rootlets and fibres that are the underground feeding organs of the plant. According to recent studies, it would appear that the rootlets and fibres of even the phylloxera-resistant stocks fall a prey and are destroyed by phylloxera. Be this as it may, the necessity to apply fertilisers to the ground is obvious, and it is the more necessary to include in the formula some ingredient rich in nitrogen, which will act as a stimulant to root growth. Generally speaking, the ground in this district is deficient in humus, and therefore deficient in nitrogen. A good way to supply the ground with humus is green manuring, that is, ploughing in a crop of leguminous plants. Perhaps the vines in this district are planted a little too close, and it would not be so easy to make a proper job of the ploughing in of the leguminous crop. Those growers who can, however, should do it, as there appears to be no better method of giving vines the nitrogen they require and improving the texture of the soil, which is such an important factor in the success of phylloxera-resistant stocks.

The following is a formula which may apply in a general way:—2 cwt. superphosphate, 1½ cwt. sulphate of ammonia, 1 cwt. sulphate of potash per acre.

In clay soils, 2 cwt. of gypsum may be included in the above formula with great benefit, gypsum being a great stimulant to vegetation. In lieu of the sulphate of ammonia, 3 cwt. of dried blood can be used. Growers who have used it on vines that had lost their previous luxuriance, and that were manifestly going back, have found it most effective. All manure that will increase the proportion of nitrogen will be found most beneficial in the case of vines that begin to look exhausted, which is often due to continuous heavy cropping year after year. Sheep droppings are very active; even more so is fowl-yard manure. I advise all growers, especially those who have small vineyards about here in poor soils, to make a good compost heap, and so utilise all refuse, straw, slops, &c., and when the heap is well rotted, fork it in round the vines.

In answer to a question as to the vine-leaf mite, *Phytoptus vitis*, Mr. Blunno replied that this acarian had never been known to cause real damage to the crop, although without doubt of recent years it had acquired a virulence not known in Europe. Some varieties of grapes seem specially subject to it, like the White Muscat. So far no remedy was known, because, being a harmless disease in Europe, nobody had ever bothered to experiment in connection with it. Heavy dusting with sulphur had been suggested, but he did not think this an effective remedy when climatic and other conditions were very favourable to its spread. The Department was carrying out some experiments at Narellan, and so far, a weak emulsion of kerosene and soap seemed to be the best.

St. Mary's.

A lecture on "Poultry for Profit" was delivered by Mr. Hadlington, Poultry Expert, before members of this branch on 25th November. By means of up-to-date lantern illustrations the lecturer interestingly emphasised the various types of breeds, and the adaptability to the Australian climate of various kinds of poultry over others. In reference to egg-laying competitions, the lecturer remarked that frequently schedules were drawn up too loosely, and hens were entered that were absolutely astray as average egg-producers.

Tallewang.

The monthly meeting was held on 31st October. The attendance was good. The Secretary read a paper regarding the cartage charge on hay, chaff, and straw, and the lucerne-growers' demand for abolition of the regular charge of 3s. 6d. per ton. An interesting discussion followed.

Temora.

The monthly meeting of this branch was held on 7th November.

A communication was received from the Director of Agriculture enclosing the Biologist's report on a sample of disease-infected wheat plant that had been forwarded by the branch for examination. The disease was pronounced to be Powdery Mildew (*Erysiphe graminis*). A request was also made that the branch should inform the Department whether it had occurred extensively, and whether any particular varieties of wheat were more susceptible to the disease than others.

After a very full discussion of the subject of this request, members expressed the opinion, in a formal motion, that all wheats grown in the district (as far as could be ascertained at present) were more or less susceptible to Powdery Mildew.

In a further motion it was opined that the matter needed further investigation, and that farmers should give special attention to next year's growing crop, with a view to gaining further knowledge in regard to the susceptibility or otherwise of all varieties of wheat grown.

Toronto.

Three new members joined this branch at the meeting on 14th November.

Upper Belmore River.

The regular monthly meeting was held on 30th November, when a very instructive discussion on maize culture took place. Samples of maize were received from the Department, and it was decided to plant them for experimental purposes.

Wollun.

The annual meeting was held on 11th October, when the past year's office-bearers were re-elected for the ensuing year.

The Secretary read a paper regarding nasal fly, as a result of which it was decided to collect more information about the pest, and to submit papers at the next meeting based upon actual observations.

The Secretary of this branch presented a balance-sheet for the past year showing a credit of £2 1s. 9d., which was regarded as very gratifying.

Yurrunga and Avoca.

A new branch was established here on 21st November, with a membership of twenty-five to commence. The following office-bearers were elected:—Chairman, Mr. Chas. Wright; Vice-Chairman, Mr. Wm. Turnbull; Treasurer, Mr. J. N. Starkey; Hon. Secretary, Mr. W. H. Waters.

Apiary Notes.

January.

R. G. WARRY, Demonstrator in Apiculture.

WHERE the honey flow is still good bee-keepers should miss no opportunity of continuing to renew very old, weak or crooked combs for both brood chamber or honey super. More or less honey is consumed in renewing the combs, according to the number of new combs required, but this consumption is not a waste, and is well compensated for by the amount of wax which can be recovered from the condemned combs and odd bits of wax and bur comb collected during the season. The wax thus obtained will pay for the comb foundation the new combs require, and the benefit of the new combs will be felt at once if the flow continues. But where the honey flow is slackening, and there is every indication of its ceasing until autumn, no attempt at getting combs built on sheets of foundation should be made. During a slack flow, or before a flow has actually set in, bees treat foundation badly; they tear it down from the top bars of the frames, chew large holes in the sheets, and because the foundation is not quickly put to use, the wires embedded in will spring away from the sheet, if the latter has not already buckled and fallen from the top bar of the frame. If frames of foundation are allowed to remain on the hives in such condition, they will go from bad to worse until a new flow of honey enables the bees to utilise them, when very poor combs with large patches of drone comb will result. If several such sheets of foundation are together in a super, the whole lot will probably be joined together by large pieces of brace comb when the flow begins, and the set will be no better for the extractor than a mass of comb built indiscriminately in a box hive.

In some localities the honey flow will be diminishing and extracting is not yet finished. Supers of honey should be removed from the hives at once in such cases, as it is already risky, and later, when the flow has practically ceased, the work of extracting and returning wet combs to the apiary will set a robbing match going in the apiary unless the work is done with the greatest care and much time is spent on it. If the least robbing gets started, return all wet combs from the extractor as late in the evening as possible; this will allow the combs to be dried during the night, and by the time the bees are flying again, the smell of honey and the excitement it causes will be gone. Where the flow is still good, extracting can be carried out with little fear of robbing.

During a good flow of honey, the infectious disease "Foul Brood of Bees" is not so noticeable as during a shortage of honey, but it can be detected in

spite of the flow, and where honey is coming in fast enough to ensure no attacks by robber bees when hives are opened, the McEvoy treatment* should be applied at once to all colonies diseased with foul brood which are strong enough to build new comb; weaker ones should be united and then treated. The treatment is certain of success if carefully applied during a good flow, but to attempt it when robbing can be easily started is to make matters worse by spreading the disease. If conditions will not permit the treatment being applied, quarantine all diseased colonies by narrowing their entrances and in every way making them as robber-proof as possible. The best plan is to close the entrances of diseased colonies at night, and shift them to a spot beyond the range of healthy colonies. If it is then certain that no robber bees can reach them, weak colonies can be united, and the whole treated for foul brood during a slack flow.

Those who have started queen breeding during last month will have some young laying queens by the end of this month, which can be used to replace the poorest of the queens in the honey-getting hives. Keep on grafting cells from the best stocks, so as to have ripe cells to give to the nuclei from which young queens have been taken. By choosing the best stock for grafting from, and having a good number of young laying queens in nuclei for introduction to honey-getting colonies in the autumn, swarming and the occurrence of bad dwindling diseases will be reduced the following spring. If ripe cells are in any of the nuclei, and a destruction of drones should begin through a cessation of the flow or bad weather, three or four of the best colonies should be fed regularly so as to ensure a drone flight when the cells have hatched. At this time of the year drone slaughter is hardly to be expected, but in the colder parts of the State it sometimes happens.

* Mr. Wm. McEvoy, Foul Brood Inspector of Ontario, Canada, has been very successful in shaking the bees into their own hives and giving them frames of foundation starters. They were allowed to build combs on these for four days. The idea is to let the bees use up the infected honey in building the combs and storing it in the built comb. These combs supposed to contain infection are now removed, when the bees are given full sheets of foundation. In many cases, however, it is not necessary to remove the first set of combs built on foundation starters, and such removing involves a considerable amount of waste.

The Eradication of Blackberries.

In answer to a recent correspondent the Department stated that spraying blackberry vines with a solution prepared from 2 lb. arsenite of soda to 10 gallons of water had been found most effective in destroying them. The most opportune time for this work is during February and March and the vines should be slashed prior to spraying.

Orchard Notes.

W. J. ALLEN.

JANUARY.

Cultivation.

SHOULD rain fall during the month the soil should receive a thorough cultivation immediately it is dry enough, and all young trees would benefit by having the soil which may have been missed by the cultivator well loosened up. Where any weeds have made their appearance in the orchard they should be destroyed with the cultivator or hoe, as all weeds, summer grass, &c., tend to rob the ground of the moisture which at this time of year is so badly needed for the trees and vines.

Irrigation.

Wherever water is available to irrigate fruit trees or vines, it is more than likely that they will require a thorough soaking this month. The water should be confined to furrows, and not allowed to flood over any portion of the land. The best use should be made of such water, and none of it allowed to run to waste.

After the soil has been well soaked, and as soon as the land is sufficiently dry to work, it should be given two deep cultivations, in order to bring it to a proper state of tilth. All vines and trees should be well worked around with a fork hoe while the soil is still damp. This will keep the ground from baking and prevent excessive evaporation.

Marketing Fruit.

Fruit intended for market should not be allowed to become too ripe before being picked, otherwise by the time it reaches the consumer it will be in an over-ripe condition. All fruit should be graded evenly and packed neatly and securely, so that it presents a good appearance when put before prospective buyers.

Summer Thinning.

Wherever apple, pear, plum, or apricot trees are found to have too much growth throughout the centre of the trees they should be thinned out, the superfluous growths being cut back to within about 3 inches of the main limbs or spurs from which they spring. This will open up the tree so as to admit light and air, which are necesssary for the proper devolopment and ripening of wood, and will also assist the tree in its efforts to develop fruit spurs. In the case of Jonathan Apple or any variety of tree which has small leaves and does not grow close and thick, it is not necesssary to remove any growth. One must be careful when thinning the growth of any young tree during the summer, and if in doubt as to the amount of wood to be removed the trees should be left alone.

Red, Brown, and Indian Wax Scale on Citrus Trees.

Trees may be either fumigated or sprayed for the destruction of these scale insects. This work may be commenced this month, provided the trees are in good strong condition. As January is usually very hot the work will have to be done on cool days or at night. Never fumigate during the heat of the day at this time of the year.

Codlin Moth.

Spraying should be given careful and regular attention, and all infested fruit should be picked from the trees and ground, and destroyed by boiling or burning, in accordance with the regulations under the Fruit Pests Act. Spraying the late varieties in the higher Tableland districts during this month will be found to be of considerable value in combating the late broods of the moth.

Fruit Fly.

All infested fruit, whether on the tree or on the ground, must be gathered and destroyed by boiling or burning.

San José Scale.

Wherever it is found that trees are affected with this scale they should receive a thorough spraying as soon as the crop is harvested, with the special resin wash.

Fruit Curing.

Peaches and apricots will be ripened and ready for drying this month. See that such fruits are handled properly, and do not allow the cured product to become over-dry. As soon as properly processed it should be stored in bags in cool rooms until it is to be packed.

Re-working Old Trees.

The latter part of this month is a good time to bud to better varieties all the poor or worthless varieties of fruit trees found growing in the orchard. The buds to be used should be taken from trees which have borne fruit of the very best quality. They should be inserted on the outer or underneath side of the limbs, where it will be found that the bark usually lifts more easily than on the upper side, and where they are more apt to form a nice open, well-shaped tree than if the buds have been inserted on the upper or inner side of the limbs.

Preparing for Cover Crops.

It will be necessary to order black tares, peas, rape, rye, or seed of whatever crop it is intended to sow between the trees for green manure. The seed should be ordered not later than the end of this month, so that it will be on hand when required.

A Couple of Orchard Hints.

Mr. Hugh Spencer, of Kelvinside, Aberdeen, in referring to the Orchard Notes published each month, mentions that his experience goes to prove that a Northern Spy, a Red Spy, or any other apple tree may be made to bear much earlier than usual by simply cutting through the bark just above each eye. Almost every eye on a branch can be made to spur in this way. Sometimes a lateral will grow out of the eye, but if this is cut back late in the summer it will fruit.

Instead of the planting-board with the V in it, he uses a little concern of his own making which he considers, as do all other orchardists who have used it, to be far superior to the board, especially for "one man" planting.

A broom-handle cut to about 3 feet long and pointed; a narrow board a foot long fastened about 4 inches from the top of the broom-handle; a piece cut out of this board about 2 inches from the end; a stout piece of twine tied on the broom-handle, run along the board and allowed to reach the ground, and a piece of lead at the end of the string, constitute the materials required.

The broom-handle is pressed firmly into the ground, so that the lead may drop where the tree is to be planted (as in Fig. 1). The peg can now be removed and the hole dug. The top of the tree is put into the cut in the board, and the twine with the lead is passed round the tree and over the board (as in Fig. 2), thus securely holding it in its place, and leaving both hands free for spreading the roots and filling in the soil.

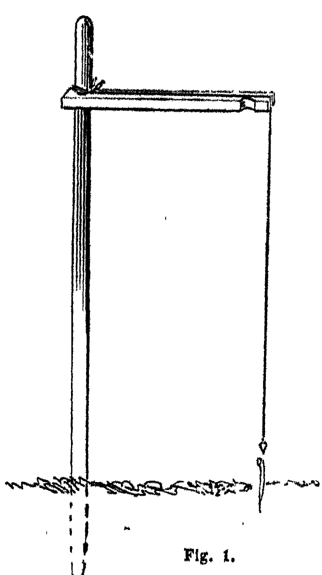


Fig. 1.

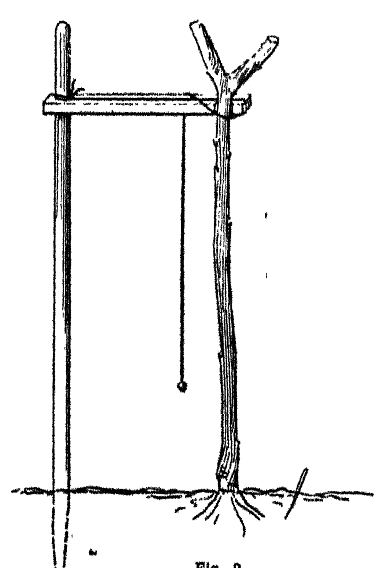


Fig. 2.

Government Stud Bulls available for service at State Farms, or for lease.

Breed.	Name of Bull.	Sire.	Dam.	Stationed at—	Engaged up till-
Shorthorn ...	Melba's Emblem (183 M.S.H.B.)	Emblem of Darbalara (100 M.S.H.B.)	Melba 3rd of Darbalara (1058 M.S.H.B.)	Berry Farm ...	‖
" ...	Imperialist ...	Florio	Lady Nancy of Minembah.	Berry Farm ...	*
" ..	The Irishman (imp.)	Tipperary Bull	Colleen Bawn (imp.)	Robertson ...	17 Mar., '15
Jersey ...	Grenadin (imp.)	Attorney (9477)	Cyril's Carnation (imp.).	Yanco Farm ...	*
" ...	Trafalgar ...	Best Man ...	Rum Omelette	Cowra Farm ...	*
" ...	Kaid of Khartoum	Sir Jack ...	Egyptian Belle	H. A. College ...	*
" ...	Leda's Retford Pride.	Dinah's Lad ...	Leda's Angel..	Wagga Farm ...	‖
Guernsey ...	The King's Mirror	Calm Prince ...	Vivid (imp.)...	South Kyogle ...	15 Feb., '15.
" ...	Star Prince ...	Calm Prince ...	Vivid (imp.)...	Casino	— April, '15.
" ...	Sky Pilot ...	Prince Souvia ...	Parson's Red Rose (imp.).	Maclean	11 Jan., '15.
" ...	Godolphin Moses (imp.)	Golden Hero of the Vauxbelets (1929)	Rosetta (6509)	Inverell	6 April, '15.
" ...	Hayes' Fido (imp.).	Hayes' Coronation 3rd.	Hayes' Fi-Fi 2nd.	Wollongbar Farm	‖
" ...	Claudius (imp.)	Golden Star II..	Claudia's Pride (imp.).	Murwillumbah ...	30 June, '15.
" ...	George III ...	King of the Roses	Calm 2nd ...	Wollongbar Farm	‖
" ...	The Peacemaker	Calm Prince ...	Rose Petersen	Wollongbar Farm	*
" ...	King of the Roses	Hayes' King ...	Rosey 8th (imp.).	Pambula	31 Dec., '14.
" ...	Lauderlad ...	Laura's Boy ...	Souvenir of Wollongbar	Mullumbimby ...	6 April, '15.
" ...	Belfast	King of the Roses	Flaxy 2nd ...	Tyalgum	28 May, '15.
" ...	Royal Preel ...	Itchen Royal ...	Hayes' Lily du Preel (imp.).	Tyalgum	30 Jan., '15.
" ...	Alexander the Great.	Claudius (imp.)	Alexandrina of Richmond.	Fredericton ...	25 Mar. '15.
" ...	Duke of Orleans	Godolphin Arthur (1664)	Flower of the Preel 3rd (imp.)	Paterson-Vacy ..	11 Mar., '15.
Ayrshire ...	Dan of the Roses	Daniel of Auchenbrain (imp.).	Ripple Rose...	Grafton Farm ...	*
" ...	Wyllieland Bright Lad (imp.)	Wyllieland Gleniffer (7229)	Wyllieland Sangie	Glen Innes Farm..	*
" ...	Isabel's Majestic	Majestic of Oakbank.	Isabel of Glen-eira.	Grafton Farm ...	‖
Kerry... ...	Rising Sun ...	Bratha's Boy ...	Dawn ...	Bathurst Farm ...	*

*Available for service only at the Farm where stationed. † Available for lease or for service at the Farm where stationed
‖ Available for special service where stationed upon application to the Under Secretary.

E

Department of Agriculture,
Sydney, 2nd January, 1915.

BULLS FOR SALE

AT BERRY EXPERIMENT FARM.

IRISH SHORTHORN.—Irish Boy (577): Passed for Vol. IV of M.S.H.B. Date of birth, 9th April, 1912; colour, rich roan; sire, Limerick's Lad (imp.); dam, Colleen Bawn (imp.). Price, **40 guineas.**

Milk yield of dam :—	Milk lb.	Fat per cent.	Butter lb.
Colleen Bawn...	6,937	3·8	309

GUERNSEYS.—Mountain Prince (593): date of birth, 12th January, 1913; colour, lemon and white; sire, Calm Prince; dam, Angelica 8th (imp.). Price, **30 guineas.**

Rohais' Lad (601): date of birth, 18th March, 1913; colour, lemon and white; sire, Calm Prince; dam, Rohais' Lassie (imp.). Price, **40 guineas.**

Milk yield of dam :—	Milk lb.	Fat per cent.	Butter lb.
Rohais' Lassie	5,537	5·1	333

Othello (605): date of birth, 4th April, 1913; colour, lemon and white; sire, Trengwainton Village Favourite (imp.); dam, Desdemona 8th (imp.). Price, **35 guineas.**

Milk yield of dam :—	Milk lb.	Fat per cent.	Butter lb.
Desdemona 8th (imp.)	6,721	4·3	340

Four-leaf Shamrock (584): date of birth, 26th November, 1912; colour, lemon and white; sire, Calm Prince; by Rose Prince (imp.); dam, Shamrock of Les Vesquesses (imp) (5394), by Royal Blood 5th (1111). Price, **30 guineas.**

	Milk lb.	Fat test per cent.	Butter lb.
Milk yield of dam	4,941	4·9	285

King of the Preel (592): date of birth, 31st November, 1912; colour, lemon and white; sire, Trengwainton Village Favourite (imp.) (2102); dam, Flower of the Preel 3rd (imp.) (209). Price, **30 guineas.**

	Milk lb.	Fat test per cent.	Butter lb.
Milk yield of dam	6,137	4·6	332

JERSEY.—Bridegroom (515): date of birth, 25th October, 1911; colour, whole fawn; sire, Best Man, 220 A.J.H.B., recently sold for £150; dam, Golden Omelette, 438 A.J.H.B.; by Sir Jack, 188 A.J.H.B.; from Rum Omelette 2nd, 699 A.J.H.B.; by Golden Lord (imp.), 39 A.J.H.B.; from Rum Omelette (imp.), 210 A.J.H.B. Price, **20 guineas.**

Best Man, 220 A.J.H.B., is by Melbourne (imp.), 56 A.J.H.B.; from Lady Tidy 3rd (imp.), 128 A.J.H.B.

Milk yield :—	Milk lb.	Test.	Butter lb.
Dam, Golden Omelette	3,064	5·6	202 (in 28 weeks).
G dam, Rum Omelette 2nd ...	5,109	4·8	289
G g dam, Rum Omelette	6,077	—	332
Lady Tidy 3rd (imp.)	5,678	5	333

BULLS FOR SALE—*continued.*

HOLSTEINS.—Captain Muller (No. 609), calved 16th May, 1913; colour, black and white; sire, Powerful of Brundee, by Edinglassie (imp.); dam, Miss Muller, by Hollander, by Bosch 3rd (imp.); g d, Margosa, by Garfield (imp.); g g d, Maggie Obbe, by Obbe (imp.); g g g dam, Margaretha (imp.) Price, **15 guineas.**

Milk yields :—	Milk lb.	Test per cent.	Butter lb.
Miss Muller (first calf)	7,262	3·4	288
Margosa	6,349	3·2	237
Maggie Obbe	7,699	—	272
Margaretha (imp.)	10,990	—	407

No. 625 (unnamed), calved 19th September, 1913; colour, black and white; sire, Cavalier, by De Wet, from Fraulien Arama; dam, Lolkje Amster, by Amsterdam; g dam, Lolkje, by Joubert, from Lolkje Veeman (imp.); Amsterdam was by Garfield (imp.), from Lady Margaret, by Obbe (imp.), from Schot 5th (imp.). Price, **20 guineas.**

Milk yields :—	Milk lb.	Test per cent.	Butter lb.
Lolkje Amster (295 days) ...	6,012	—	259
Lolkje (first calf)	5,828	3·5	234
Lady Margaret (first calf) ...	6,000	—	277

GEORGE VALDER, Under Secretary, and
Director of Agriculture.

AGRICULTURAL SOCIETIES' SHOWS.

Secretaries are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 21st of the month previous to issue. Alteration of dates should be notified at once.

1915.

Society.	Secretary.	Date.
Gosford and Brisbane Water A. and H. Association	H. J. Gates ...	Jan. 15, 16
Albion Park A., H., and I. Association	M. A. Brown ...	,, 20, 21
Kiama A. Association	G. A. Somerville...	,, 26, 27
Wollongong A., H., and I. Association	W. J. Cochrane ...	,, 28, 29, 30
Berry A. Association	S. G. Banfield ...	Feb. 4, 5
Wyong A. Association	C. R. Seabrook ...	,, 5, 6, 7
Moruya A. and P. Society	H. P. Jeffery ...	,, 10, 11
Shoalhaven A. and H. Association (Nowra)	H. Rauch ...	,, 10, 11
Central Cumberland A. and H. Association (Dural)...	H. A. Best ...	,, 19, 20
Dapto A. and H. Society	J. H. Lindsay ...	,, 23, 24
Guyra P., A., and H. Association	P. N. Stevenson...	,, 23, 24, 25
Alstonville A. Society	C. D. McIntyre	,, 24, 25
Campbelltown A. Society	F. Sheather ...	,, 24, 25
Manning River A. and H. Society (Taree)	L. Plummer ...	,, 24, 25
Gunning P., A., and I. Society	J. R. Turner ...	,, 24, 25
Robertson A. and H. Society	Ross Graham ...	,, 24, 25
Tumut A. and P. Association	T. E. Wilkinson...	Mar. 2, 3

AGRICULTURAL SOCIETIES' SHOWS—*continued.*

1915.

Society.	Secretary.	Date.
Uralla A. Association	H. W. Vincent ...	Mar. 2, 3, 4
Tenterfield P., A., and M. Society	F. W. Hoskin ...	„ 2, 3, 4
Bega A., P., and H. Society	H. J. B. Grune ...	„ 3, 4
Braidwood P., A., and H. Association	L. Chapman ...	„ 3, 4
Gloucester A., H., and P. Association	G. E. Furness ...	„ 3, 4
Camden A., H., and I. Society	A. Thompson ..	„ 3, 4, 5
Newcastle A., H., and I. Association	E. J. Dann ...	„ 3, 4, 5, 6
Berrima District A., H., and I. Society (Moss Vale)...	C. E. Wynne ..	„ 4, 5, 6
Blayney A. and P. Association	H. R. Woolley ...	„ 9, 10
Glen Innes & Central New England P. & A. Assoc'n ...	G. A. Priest ...	„ 9, 10, 11
Coramba District P., A., and H. Society	H. E. Hindmarsh	„ 10, 11
Tumbarumba and Upper Murray P. and A. Society...	E. W. Figures ...	„ 10, 11, 12
Nepean District A., H., and I. Society (Penrith) ...	P. J. Smith ...	„ 11, 12
Wauchope P., A., and H. Society	A. D. Suters ...	„ 11, 12
Gundagai P. and A. Society	A. Elworthy ...	„ 16, 17
Mudgee A., P., H., and I. Association	P. J. Griffin ...	„ 16, 17, 18
Cobargo A., P., and H. Society	T. Kennelly ...	„ 17, 18
Inverell P. and A. Association	J. McIlveen ...	„ 17, 18, 19
Wallamba District A. and H. Association (Nabiac)...	T. R. Dun ...	„ 18, 19
Goulburn A., P., and H. Society	G. G. Harris ...	„ 18, 19, 20
Quirindi P., A., and H. Association	H. H. Rourke ...	„ 23, 24
Batlow A. Society	C. S. Gregory ...	„ 23, 24
Luddenham A. and H. Society (Wallacia)	F. S. Leggo ...	„ 23, 24
Molong P. and A. Association	W. J. Windred ...	„ 24
Warialda P. and A. Association	C. O'C. Murray ...	„ 23, 24, 25
Bangalow A. and I. Society	W. H. Reading ...	„ 23, 24, 25
Macleay A., H., and I. Association (Kempsey) ...	E. Weeks... ...	„ 24, 25, 26
Upper Hunter P. and A. Association (Muswellbrook)	R. C. Sawkins ...	„ 24, 25, 26
Dorrigo A., H., and I. Society...	W. R. Colwell ...	„ 24, 25
Coonabarabran P. and A. Association...	G. B. McEwen ...	„ 24, 25
Crookwell A., P., and H. Society	J. H. Huxley ...	„ 25, 26
Royal Agricultural Society of N.S.W.	H. M. Somer	Mar. 30 to Apl. 7
Eastern Dorrigo District A., H., and I. Society (Ulong)	T. B. Timms ...	April 5
Adaminaby P. and A. Association	W. Delany ...	„ 7, 8
Tamworth P. and A. Association	J. R. Wood ...	„ 20, 21
Richmond River A., H., and P. Society (Casino) ...	D. S. Rayner ...	„ 21, 22
Orange A. and P. Association	W. J. I. Nancarrow	„ 21, 22, 23
Dungog A. and H. Association...	C. E. Prout ...	„ 28, 29
Clarence P. and A. Society (Grafton)	G. N. Small ...	May 5, 6, 7
Lower Clarence A. Society (Maclean)	J. McPherson ...	„ 11, 12
National A. and I. Ass. of Queensland (Brisbane) ...	J. Bain	Aug. 9–14
Narandera P. and A. Association	H. S. Robinson ...	„ 10, 11
Gunnedah P., A., and H. Association	M. C. Tweedie ...	„ 24, 25, 26
Murrumbidgee P. and A. Association (Wagga) ..	A. F. D. White ...	„ 24, 25, 26
Cowra P., A., and H. Association	E. W. Warren ...	Sept. 14, 15
Temora P., A., H., and I. Association	A. D. Ness ...	„ 21, 22, 23
Northern A. Association (Singleton)	J. McLachlan ...	„ 22, 23, 24
Yass P. and A. Association	E. A. Hickey ...	„ 29, 30

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VOL. XXVI. PART 2. FEBRUARY 2, 1915.

Agricultural Gazette of New South Wales.

Dairy-farming on the Murrumbidgee Irrigation Area.

M. A. O'CALLAGHAN.

I HAVE written on this subject when the conditions for dairying were at their best. Let us now review matters when weather conditions are of the very worst. The first article* was more in the nature of a prophecy, after having made a brief inspection of the conditions prevailing. The conclusion then was that the Yanco section of the Irrigation Area exhibited a great many conditions which tended towards success in dairy-farming. Some months afterwards another visit was made to the Area, and on this occasion quite a considerable amount of settlement had taken place, and I was in a still better position to judge. I was also aided during the second inspection by the increased experience of the Yanco Experiment Farm, as regards dairying on somewhat larger scale than had been carried out during the initial years of the establishment of that institution. The opportunity was afforded on the second occasion of seeing some dairy cattle, which had been purchased on the Coast as heifers from 12 to 18 months old, and which had gone through rather a trying season. At Yanco, being milked as developed cows, and with good natural pastures available, the improvement made in these cattle was more than remarkable. At the time that my second article† was written, I had also the experience of about four months of actual dairying, carried on at a farm under local management, with occasional supervision by myself. As a result of observations made up to that time, I wrote and spoke enthusiastically of the possibilities which the Area presented to dairy-farmers who possessed previous experience of farming under ordinary conditions, and who were prepared to give some study to the carrying on of the industry under the altered conditions necessary on an irrigation area.

At the present date of writing, I have had two years' definite experience of dairy-farming on the Area, and during this period we have witnessed probably one of the best seasons that this district has ever had, as far as natural grasses are concerned, and we have also certainly witnessed the worst season which the district has experienced, from this point of view, in the memory of living white men.

With an experience limited to extremes, it is needless to say it is rather difficult to form a judgment which will be found to be correct on all points. Writing as I am to-day, with the very worst possible conditions prevailing, as far as stock-farming is concerned, it is almost impossible to separate one's

* Yanco as a Dairying Proposition. *Agricultural Gazette*, February, 1913.
† Dairy-farming on the Yanco Irrigation Area. *Agricultural Gazette*, December, 1913.

mind from prevailing factors, and imagine what things should be during normal average seasons. Since this record drought struck the south-western parts of the State I have, however, made repeated visits to this and other parts of Riverina, and have closely observed the progress on the Irrigation Area on each occasion. I am glad to be able to state that, despite very trying conditions, there is every reason to believe that the opinion formed on the very first occasion on which I wrote on the subject has every likelihood of being realised; and in spite of everything that could possibly be brought to bear, from a weather point of view, to militate against a beginner in this industry, there are good indications that the men who knew the business before coming will make a success even this season.

Three months ago, when wintry conditions prevailed, and when, instead of regular autumn and winter rains, resulting in an abundant growth of winter herbage and grasses, the rainless land presented on the non-irrigated sections of the Area a desert-like appearance, it was difficult to maintain the courage of one's earlier opinions, especially when here and there one met with a smiling friend who hailed him with the question, "What about those luxuriant pastures that you wrote of a year ago?" A study of the weather chart extending back over a period of forty years has, however, consoled me with the fact that in no year over that period, prior to this, was an autumn and winter experienced which did not give a few inches of rain at least.

There are men on the Area who have never had any experience of a drought. They have no place to carry their dry cows and their yearlings—and they are complaining. The same men a year ago were full of enthusiasm. I wonder what these farmers would have done if they had experienced a bad drought in a district where there was no irrigated land to carry their milch cows, not to speak of their dry stock.

Development.

In May, 1913, a butter factory was opened at Leeton, and the number of cream suppliers could then be counted on the fingers of one hand. In November, this year, there were ninety-nine cream suppliers to this factory. In addition to this, a large number of farmers had taken up land during the spring months, with the intention of carrying on dairy-farming, and it is most satisfactory, from a development point of view, to note that every farm suitable for dairying that has been made available has been taken up; so that, given ordinary rains next autumn, a big increase should take place in the factory supplies.

Owing to the extremely high prices prevailing for fodder crops for agistment for stud sheep and for the agistment of horses belonging to outside farmers, many settlers who intended carrying on dairying this summer are "making hay while the sun shines," either by letting their lucerne paddocks at abnormal rates or taking horses on agistment at from 4s. to 5s. per head per week. In the end this may be a short-sighted policy, but the money temptation is considerable, especially to those farmers who had spent most of their capital in development.

In addition to the butter factory referred to, a small cheese factory is being established in the Mirrool section of the Irrigation Area, and a bacon factory is in process of being completed close to the Yanco Railway Station.

Quality of Dairy Products.

All the butter made at Leeton factory is the produce of pasteurised cream, and I have seen no better butter made in Australia than that which has recently been turned out at Yanco. The increased local demand for this butter is sufficient testimony to its favour with the public; but the quality of the butter is so superior that, in justice to the farmers, the Commissioner should see that the very highest prices should be obtained. It compares most favourably with the produce of Western Districts of Victoria, and the price for this quality of butter on the Melbourne market should be a guide as to the value of the Yanco product.

Cheese.

Some trial lots of Cheddar cheese were made by Dairy Instructor Wallace at Leeton last autumn, and, as anticipated, the flavour of the ripe cheese proved to be excellent. Given a return to normal seasons, I anticipate that the quality of this product—made during the autumn, winter, and spring months—will be equal to anything turned out in Australia; provided, of course, that the manufacture is attended to by a first-class maker.

Lessons of the Drought.

Experience is the only teacher that is heeded by the average farmer, and though it would probably be unwise to formulate a policy on the experience of a season the like of which has not been previously known, still an analysis of previous experiences of old residents goes to show that, whereas autumn and winter rains are fairly reliable, the quantity is not sufficient to give at all times an abundance of natural pasture on the non-irrigable lands. For this reason the far-seeing farmer will always endeavour to lay in a stock of food against winter possibilities. There is no question but that lucerne hay is the most valuable and the most easily procured for this purpose. Owing to the immature condition of most of the farms, in many cases lucerne hay was not possible this year; but within a couple of years, when all the farms have been laid down with a certain amount of lucerne, every dairy-farmer should be able to put by some hay against possible winter drought.

The question of silos has been raised, but our experience so far would not warrant their erection, for where a man can make lucerne hay, he does not want to have recourse to ensilage making.

Fodder Crops.

More especially does the silo question seem unnecessary in view of the fact that on the irrigable land green crops can be grown to provide the necessary succulent food to mix with lucerne hay in order to make a complete ration. Sorghum grows abundantly, and this would come in for late autumn or early winter use, whereas green barley, wheat, and oats can be utilised at a later stage; and if a farmer desires extra green fodder in the summer, maize supplies the ideal combination to go with lucerne hay.

Young Stock.

Another lesson which the drought has taught is, that it is not a wise policy for the farmer to retain any steers, and only the very best of his heifer calves. Judging by the previous year, it appeared to be a very simple thing to maintain young stock on the Area, by placing them on agistment on some of the dry paddocks owned by the Commissioner and available for agistment; but this drought has shown that seasons are likely to occur when this scheme cannot be carried out. It would, therefore, appear wise for the dairy farmer to put the milk which he would give these surplus calves to pigs, which, now that the bacon factory is practically completed, should form a profitable source of revenue.

Quality of Cows.

In a previous article the necessity for only keeping one quality of cow on the Irrigation Area was referred to. This season has emphasised the necessity for this policy. With wheat-farmers from outside the area willing to pay anything from 4s. to 5s. per head per week for the agistment of their horses, it goes without saying that the dairy-farmer who had bad cows could not resist the temptation of making a little money easily; and, consequently, some sent their cows to the sale-yards and turned their attention, for the time being, to catering for the agistment of horses, and in some cases stud sheep. When the summer is over, these farmers will require to stock up again with cattle, and it is to be hoped that their previous experience will teach them to avoid inferior animals. The Irrigation Commissioner has done his best to get good stock introduced to the Area; and the heifers that were purchased have, on the whole, turned out remarkably well.

The policy, however, of purchasing cows that have been tried before by other people is not to be recommended, except in very exceptional cases. If a man in a dairy district is willing to sell his whole herd, or a part thereof, it goes to show that he is not making a success of dairying, and the question naturally arises, "Is his want of success due to the poor quality of his cattle?" Intending dairy-farmers would do well to bear this aspect of the case in mind. Purchase heifers and do your own culling is the only wise method of procedure. Any cow that will not on her second calf, under fair conditions, give 200 lb. of butter in the year, should not be kept on the Irrigation Area.

Relationship between Irrigable and Non-Irrigable Land.

From the very first I have laid it down that non-irrigable land, to be of much value to the dairy-farmer, should form an integral part of his holding. In connection with this, I pointed out that the first subdivision made was inconsistent with successful permanent dairy-farming, inasmuch as no provision whatever was made for cheap non-irrigable land attached to the irrigable section. Since then all this has been altered, and to-day special provision is made in the subdividing of the land for a certain number of complete dairy-farms on the lines here referred to. Nothing has shown the absolute necessity for this arrangement better than the severe drought which has prevailed now for several months. On the greater portion of the Area the

inferior land, classed as non-irrigable, is of a level suitable for periodic flooding; and if the men who were dairying a year ago had had a correctly designed dairy-farm to work on, they could have flooded the non-irrigable section of their farms, either in the autumn or early spring, so that they would have cheap fodder in sufficient abundance to maintain at least their dry cattle and young stock in good condition. Recently I inspected a farm which a young ex-student of Hawkesbury College took up about eight months ago, and on one portion of this the natural grass was quite 12 inches high as the result of two waterings during the spring and early summer months. Of course, it is easy to be wise after an event, but there is also such a thing as making provision for possibilities; and as a winter drought is evidently a possibility in this district, it goes without saying that in the future most dairy-farmers whose farms are suitable therefor will take the precaution of watering a small section of their non-irrigable land in the late autumn, should good rains not have fallen by that time. This is, practically speaking, taking out an insurance policy against a winter drought. Should good rains follow, it is possible that the section watered may, for the time being, have too much of a good thing; but the dairy-farmer will be consoled with the fact that the other section of his non-irrigable land will be suitable for the carrying of his herd until the section that was both irrigated and rained on will have dried up sufficiently to enable stock to be carried thereon without puddling the soil.

The Value of Irrigable and Non-Irrigable Lands.

In the second article referred to, I stated that when the dry section of a dairy-farm was part and parcel of the whole, the non-irrigable portion would be worth approximately 4s. per acre per year. Probably the actual pastoral value of such land would approximate about 2s. 10d. per acre at the outside; but owing to the fodder crops which can be grown with actual certainty on the irrigable section of the farm, the non-irrigable portion had a higher value than if no irrigation was employed. At the time that this estimate was made we had experienced an exceptionally good season, and whereas allowance was made for this, I feel quite sure now that the estimate given was one which would only represent a true valuation when the non-irrigable land was capable of being watered, if necessity arose, during autumn or early summer. In looking over the valuations placed on irrigable land in the neighbourhood of Yanco, I have noted that there are quite a large number of farms set down by the valuers as being suitable for the growing of lucerne and other crops, and on which a rental of 6s. per acre per annum or under has been placed. It therefore appears that no more than 4s. per acre rental should be charged on the non-irrigable section of any dairy-farm, even though such land is capable of being flooded for grass purposes. Intending settlers should, however, bear in mind the fact that the cutting of the necessary waterways on a 150-acre farm adds considerably to the first cost of the land as presented to the settler, and, therefore, the cost of the non-irrigable section of a dairy-farm properly subdivided is higher than a man would imagine it should be, when comparing this dry section with the irrigable land on, say, a 50-acre farm.

Actual Earnings of Dairy-farmers during their First Year.

The young dairy-farmer before referred to, on whose farm there is at present such an abundant growth of natural grasses, informed me that his cows have, during the last six months, averaged approximately 16s. per head per month; but he pointed out that all these animals were on their first calf, and there was, practically speaking, no food available other than the natural herbage referred to. This young farmer is now gradually developing the irrigated section of his farm; has planted some corn to utilise as green feed later on, and is arranging to sow some lucerne during next autumn. He is perfectly satisfied that he can make dairy-farming a success, and when he gives this as the result of his experience during a bad season, it goes without saying that he will be much more enthusiastic should we get an early return of favourable seasons during the autumn and winter for the growth of natural pastures.

Another settler to whom a visit was paid was Mr. Dooley, a man of experience in coastal dairy-farming, who a few months ago purchased a partly improved farm near Leeton, consisting of an area of 58 acres, almost all of which is irrigable. This farm is on what used to be the boundary of the country on which the late owner of the Yanco Station grew lucerne in considerable quantities, and on portion of Mr. Dooley's farm there was a certain amount of old lucerne scattered throughout the pasture. Beyond this there was practically no fodder available, and this settler has been carrying his cows on the natural grasses during the last four months. He began with eight cows, and at the present time has twelve in milk. The average of each cow during the four months ending 31st October was £1 2s. 10d. per month in actual cash received from the butter factory. This, undoubtedly, is a good return, but Mr. Dooley states that it would have been much better had he been able to have a better selection of cows in the first instance. Mr. Dooley is gradually developing his farm, with a view to putting a considerable portion of it under lucerne, and in the meantime, as may be seen, he is paying expenses by maintaining a small herd and looking after them himself.

Among experienced dairy-farmers who have done well, and who have great faith in the future of dairying in the Yanco district, is Mr. Paterson, of Stony Point—a man who has had considerable experience in New Zealand, and who considers the opportunities for an experienced dairy-farmer here as very promising. Mr. Paterson averaged £10 per cow during last year, and for a time this season was making 30s. per cow per month. He has considerable help in his own family, and thereby lies one of the secrets of his success.

A Personal Experience.

In a previous article reference was made to the fact that during October, 1913, twenty-nine cows kept on a farm owned by me, but managed locally, had shown a yield, judging by the amount of milk which they gave and the value of butter-fat at the time, equal to a value of 33s. per head. At that time there was a most prolific growth of "Crowfoot" and other valuable herbage, in addition to which there was a certain amount of old lucerne in the pasture.

Owing to the unkind season which presented itself, a certain number of good producing crossbred cows was disposed of during the winter and early spring, and, therefore, I cannot make an exact comparison between last year's results and those of this year ; but twenty-four cows, during the month of September, returned me from the butter factory a sum of 27s. per head. In addition to this, a certain amount of new milk was retained on the farm for the purpose of feeding young purebred calves. During October, however, the price of butter dropped, and there was also less actual good pasture available, and the cows averaged only 20s. per head.

Food Supply.

During the first week in May I happened to visit this district, and this was the time at which the last irrigation watering for the season was available. In the ordinary course one would not have need to irrigate anything except growing crops at this time, and I discussed with the Manager the advisability or otherwise of flooding a certain portion of land which it was intended to use for pasture during the winter months. Opinions on the Irrigation Area from those with the longest experience of the district were against the use of water at this period for pasture purposes. I, however, decided not to put all my eggs in the basket carried by the local clerk of the weather, and decided to irrigate about 20 acres of land which contained a certain amount of old lucerne and natural grass. The paddock was then shut up until the first week in July, when the dairy herd were allowed to graze thereon. By that time the pasture, consisting mostly of barley grass and lucerne, had grown to a height of approximately 15 inches, and on this the dairy herd was carried until the end of August, with the addition of a little lucerne and oaten hay. Had all the land of the same description as that referred to been watered, we would have had another 20 acres of first-class pasture, which would have carried the herd to the end of October, at which date there was in the special lucerne paddock an abundant growth for cutting.

Readers can draw their own conclusions from this experience. At the present time there is ample feed, in the shape of lucerne and some artificial grasses, for the reduced milking herd, as well as sufficient to carry the dry stock, but owing to the want of pasture on the non-irrigable land, we have had to transfer the yearlings to the coastal districts for grass. I am, however, comforted in this direction by the knowledge that the local State Experiment Farm has had recourse to similar measures.

A dairying estate situated in an inland district has had the misfortune to have been visited by this unprecedented drought, and I have been informed that instead of milking 600 cows there, as they were doing a year ago, they are not now able to carry a herd of fifty. A fact of this kind makes a man with small capital who intends to embark in dairy-farming, in any but the most favoured coastal districts, meditate whether it would not be advisable for him to throw in his lot with the numerous other farmers who are, at the present time, developing dairy-farms on the Yanco Irrigation Area.

Hints to the Intending Settler.

Despite the adverse season which this district has encountered, and despite the good season prevailing on the coast, with a seventeen years' experience in this State with the opportunity of making observations in every district, I am of opinion that, given suitable labour in his own family, a dairy farmer can do as well at Yanco as he can in any other part of the State, provided he will take the trouble to study local conditions, and learn all that is possible about the application of water and the growing of suitable fodder crops for dairy cattle under irrigation conditions.

Labour and Capital required.

There appears to be a land hunger existent in the souls of most men who go in for farming of any kind, and the intending irrigationist is no exception to this. The prevailing idea appears to be to get hold of as much land as the local conditions will allow, but the settler who intends to go in for mixed farming would be well advised to aim at a minimum rather than a maximum of land suitable for the maintenance of a family. Most intending irrigation farmers have had no previous experience, and, therefore, are not able to form anything like a correct estimate of the time and labour necessary to develop an irrigation farm to its fullest and most profitable extent. A little experience, however, will show them that there is very much more cultivation and close application required in connection with developing an irrigation farm than that which is necessary in order to successfully develop either a dairy-farm or a mixed farm under ordinary circumstances, in districts where the rainfall is sufficient to warrant mixed farming. An embryo irrigation farm takes a good deal of understanding, and the irrigationist will find that it presents a variety of phases which require close study if the best results are to be achieved. On most of the farms of any size on the Yanco and Gogeldrie sections of the Murrumbidgee Irrigation Area there is a variety of soils, and these soils require correspondingly varied treatment. It may even be found necessary to arrange the subdivision fences to a considerable extent to meet the variety of soils, because an alteration in the character of the soil will probably mean an alteration in the crop which it will be found most advisable to grow thereon, and it is better to have subdivision fences between lucerne paddocks and other cultivation.

Labour.

For a dairy-farm with 50 acres of irrigable land and, say, 100 acres of dry land, three working units are required. These may consist of one experienced farmer, a young man, and a boy of, say, 15 years. With this available labour the dairy-farmer can develop his property successfully without having recourse to a very uncertain labour market. There is no form of farming wherein the individual interest of the worker is more required than on an irrigation farm, and unfortunately it is not always possible to get this interest shown by ordinary hired labour. A great deal of the initial work can be done at very reasonable prices on contract terms, and this will facilitate an early development. Hence the man of some experience in dairying can, very soon after

the start, in ordinary seasons, be in a position to earn enough to ensure his food supplies without encroaching on his capital for this purpose.

The Commissioner has now an Instructional Staff in this section, which the intending selector should consult. Mr. H. R. Alexander, late of Arrawatta, and previous Manager of Wollongbar Experiment Farm, is in charge of this section.

Capital.

Although many of the settlers who are doing fairly well on the Irrigation Area have begun with less than £500, still this is the amount that may be considered the minimum for an average settler to have before he embarks in dairy-farming under irrigation conditions. Part of this capital will be required to keep himself and his family during the first three months after he goes into occupation. If a farmer has had no experience in Australia, and has had no experience of irrigation conditions of farming in other countries, he will require probably about one-third more capital before I would recommend him to this section of the industry. Unfortunately, there is a sort of general feeling that a dairy-farmer, in order to be successful, does not require a great deal of experience. This is probably due to the fact that a number of young men who have taken up land in favourable districts, and whose experience was very limited, have succeeded. Under irrigation conditions, however, a sound knowledge, not only of stock but of cultivation, is required before the best results can be obtained. In fact, I would rather see an inexperienced farmer take up any other section of farming than that of dairying A sound knowledge of dairy cattle alone will take him several years to acquire, and their good management, as well as the careful feeding and management of pigs, are absolute essentials to success.

I stated in an article published locally that the inexperienced dairy-farmers would pass away from the Irrigation Area, and I am still of the same opinion. The majority of them will either leave the Area or they will adopt some other form of earning a livelihood.

The Economics of Dairy-farming.

At the outset I laid down that, under the conditions prevailing on the Irrigation Areas, farmers could not afford to defy the ordinary laws of economics in connection with dairy-farming. There are special reasons why this applies to this new settlement more forcibly than to the dairying districts of the State generally. During the summer months at least, the amount of labour per cow which has to be given is greater at present than on coastal districts. This is due to the fact that there are, practically speaking, no permanent pastures available for summer use in this district, and nearly all fodder has to be cultivated and hand-fed to cattle. Until permanent pastures have been developed this condition of things will prevail, and, therefore, it is evident that only cows giving high yields can pay their way. In an ordinary season, during the late autumn, winter, and early summer months butter can be produced at a minimum cost, as far as labour is concerned, owing to the great natural pastures which are a feature of the Riverina district. It is

generally understood that lucerne is to be the basic fodder during summer months, but the grazing of cows on lucerne is associated with considerable risk, and unless a man herds his cows carefully, he is sure to lose some animals. On the other hand, if he desires to cut his lucerne and feed it in a semi green state to his cattle, the labour necessary is considerable. This forces every farmer into the question of considering the advisability of laying down on a part of his irrigable section a certain area of permanent artificial grasses.

Perm e t Pastures.

Since the previous articles on the Irrigation Area were written, a change has come over the position, in so far that the sowing of paspalum grass on the Area is forbidden.

At one time I pointed out that paspalum, from several points of view would probably be the most useful grass for the Yanco dairyman. It gives a very large amount of fodder, provided plenty of water is available, and it also covers the surface of the soil so completely that it prevents the caking of the surface after watering, and therefore cultivation becomes unnecessary. It is possible that other grasses, if sown very thickly, may have the same effect; but from experience so far, I have not seen any that cover the surface so quickly and so effectively as paspalum.

Rhodes grass showed great promise last summer, and where it was established then considerable growth is being made this summer, but the Rhodes grass which was sown last autumn has done very little good so far this year. This is, no doubt, due to the extremely dry weather prevailing and to the caking of the surface referred to.

I have still great hopes of Perennial Rye grass and of Cocksfoot, but I have, practically speaking, abandoned all hope of Prairie grass being of much use except in shady places. The advocates of Rhodes grass are numerous, as it is claimed for it that a good deal of fodder can be obtained without any risk of its interfering with other crops on the farm. On this point I have some doubt. This year I have noticed Rhodes grass shooting in some of the head ditches; but paspalum and Rhodes grass should be treated like thistles they should be kept out of the channels and head ditches, so as not to infest the lucerne paddocks.

Couch grass has made its appearance in several places, no doubt through other grass-seeds sown not having been free from the seeds of this plant. I consider couch grass distinctly inimical to the settlement, because it is an extremely difficult grass to kill in orchards and cultivation paddocks. It can withstand dry weather, whereas paspalum can be killed at any time by denying it water. The Commissioner has prohibited the sowing of couch grass, and farmers would be well advised to purchase grass seed only from reliable merchants who will guarantee the purity thereof.

Pigs as a Feature of Dairy-farming.

Owing to the growth in population, and owing to the good conditions generally which prevail throughout Australia, as far as the standard of

living is concerned, as well as to the fact that beef and mutton have risen considerably in price during recent years, bacon has taken an important place in the industries of the State, and as most of the pigs required to make this bacon are raised in conjunction with dairying, it goes without saying that the pig is a very important feature of almost any dairy-farm. Owing to the large area from which Sydney draws its food supply, and to the fact that the farmer who engages in this trade is not in a position, on account of the want of separated milk, to raise pigs economically, the production of pigs within this distance of the metropolis has decreased considerably of late years. The deficiency has been made up by development in other districts, more especially on the North Coast; so much so, that last year, when the Richmond River farmers experienced their first serious drought, the pig was found to be the main support of many farms where there was not sufficient grass to maintain the cows in milking condition. Pigs thrive so well on lucerne, and lucerne thrives so well on the Murrumbidgee Irrigation Area, that a very big development in the bacon industry may be expected there. A number of farmers are laying themselves out to raise pigs without keeping any cows whatever; and no doubt, owing to the number of succulent plants (especially lucerne) suitable for pig-feeding which can be raised with certainty on the Area year by year, it may be found quite a good proposition to either raise or fatten pigs on farms on the Irrigation Area without the useful aid of separated milk. This is a question which the pig-farmer will have to work out for himself; but the dairyman who wishes to keep a number of pigs has no problem to solve, because experience has shown that, by grazing pigs on lucerne and giving them plenty of room, these money-making animals will thrive with great rapidity.

Under these conditions there should be a great freedom from disease, because it is when pigs are confined to very small areas, and kept so confined in large numbers, that disease is most frequent.

One point which it will be advisable to look out for in connection with pig-breeding is, to use the greatest care not to allow the breeding sows to become too fat in the summer months. Last year, when the weather conditions were suitable for plant growth, I carried six breeding sows for about four months on a small patch of well-established lucerne, which had been subdivided into two portions to facilitate watering. Though given but very little separated milk, they became unduly fat, and, in consequence, considerable difficulty was experienced in getting them reduced to breeding condition again. Fat sows look very well, but in a warm climate like this is in summer, it does not pay the pig-farmer to allow appearances to weigh too much with him in this matter.

A review of the bacon imports into Great Britain clearly shows that when local markets are supplied, there is a very big opening for pig products in England. In 1912, bacon imports into England amounted to £14,555,548 sterling. In addition to this, the sum of £2,270,379 was paid for hams, while £791,706 was paid for fresh pork, and £270,265 for frozen pork, making a total altogether of £17,887,898. Of this amount Canada supplied

£1,909,773 worth of bacon, and if it pays the Canadian farmer, under the extreme weather conditions prevailing in the Dominion, to produce bacon for export to England, there certainly ought to be a good opening for the Australian product, as pigs can be kept in this genial climate so much cheaper than is possible in Canada.

General Co-operation necessary.

It is a most satisfactory matter for dairy-farmers to note that a well known co-operative concern in New South Wales has decided to open a branch at Leeton, but at present there is very little produce, with the exception of butter; and it is to be hoped that settlers, other than dairy-farmers, will strongly support the co-operative effort, so that the work can be carried on with a minimum of expenditure.

By a combination of forces the settlers can cheapen production, reduce selling charges, purchase under the cheapest possible conditions, and greatly add to the amenities of life.

Cordial co-operation with the officials of the Commission is also necessary; in fact, every settler may be considered to be an official concerned in the improvement of State property as well as in the improvement of his own individual position.

A Visit to Victoria.

I have recently had the advantage of inspecting some of the irrigated areas in Victoria, and of conferring with men of experience and repute who have had the opportunity of inspecting all the irrigated areas in Victoria; and the general opinion held is that dairying and pig-raising will prove, in the long run, the most profitable industries in connection with the average class of irrigable land, provided there is a certain amount of labour available in the families of the settlers. From what was seen there, I have come to the conclusion that the settlers at Yanco this year must congratulate themselves that they are farming on an irrigated area.

Throughout a great section of Victoria and in South Australia dairy farmers, as well as wheat farmers, have had a most deplorable season, and the indications are that irrigation will receive increasing attention even in these States, where already considerable development has taken place.

Conclusion.

In conclusion, I would add that Yanco is a place for workers. The amateur idler has no niche to suit him here. Every industrious, intelligent settler on the Area appears to be making a success of his holding. I have visited some farmers who came to Yanco from Patagonia a little over a year ago. They had irrigation experience. They sowed lucerne, and, owing to drought prices, they have made enough in a few months to pay for all the development work done on their farms.

Fungus and Other Diseases of the Apple and Pear.

[Continued from page 57]

G. P. DARNELL-SMITH, B.Sc., F.I.C., F.C.S., Biologist; and E. MACKINNON, B.Sc., Assistant Biologist.

Apple Scab (*Venturia inæqualis* (Cooke), Winter).

THIS disease is perhaps the commonest of apple troubles in Australia, and it is the cause of more damage than any other. Its habit of attacking the plant tissues while they are still young and quite tender is responsible for much fruit being spoiled while it is quite small, but the beginning of the infection has really to be dated back to an even earlier stage. To the orchardist, the effects are most obvious upon the fruit, but the first parts subjected to attack are the leaves of the blossom-buds—the parts first exposed—and as they are followed by flowers and then by the leaves from the leaf-buds the infection extends. The flower stalks when attacked show black patches on the surface. These patches extend, and soon the flower and stalk blacken shrivel, and die (Fig. 13).

On the leaves, the attack may appear on both surfaces. On the lower surface the diseased area usually appears as a discolouration slightly darker than the normal green of the leaf. The colour deepens with age until black, and the spot is more or less velvety (Fig. 14). There is sometimes a tendency for the spots to extend along the veins and to spread irregularly into the healthy tissue, whereas, on the upper surface, the spot appears first as a lighter green than the healthy tissue, but dull and somewhat velvety. The spots may be few and scattered, or so numerous as to coalesce, covering almost the whole surface. The diseased areas may be distinctly bordered, or they may spread out indefinitely into the healthy tissue. Later the leaves may crack and shrink.

On the fruit, dark-coloured spots appear, small at first and often sharply bordered (Fig. 15). As these grow, the central and older part becomes bare, brown, and corky, while the margin is black. A more or less whitish band, due to the loosened cuticle, may surround the black margin. The thick, corky cuticle that develops may begin to crack, and in bad cases the fruit becomes fissured and distorted, and the surface roughened and scabby.

The twigs are less commonly attacked. They have a scurfy appearance, the bark becoming blistered and ruptured in places.

The cause of the disease is a fungus known in one stage of its development as *Venturia inæqualis*, and in another stage as *Fusicladium dendriticum* (Fig. 16). The former (the ascus or perfect stage) is the one developed

by the fungus on the fallen leaves at the end of the season to prolong its life through unfavourable winter conditions, and to act as the source for the renewal of its active stage (conidial or Fusicladium stage) in the spring. The ascus stage begins to develop in the scab-infected leaves which commence to decay on the ground in the autumn or early winter. The mycelium, which had been living just below the epidermis of the leaf, penetrates the whole tissue and begins to form perithecia. These are black cases, in which many sausage-shaped bags, known as asci, are produced. Each ascus contains eight spores (ascospores) (Fig. 16 E). The perithecia are embedded in the leaf tissue, usually protruding sufficiently to form a small pimple just about visible to the unaided eye. The spores are brownish, divided by a cross-wall into two unequal cells, hence the name *inaequalis*. With a plentiful supply of moisture towards the time of maturity (about the beginning of October), the perithecia enlarge and the ascospores are forced out. It has been ascertained by investigation that as many as 20,000 to 30,000 spores can be discharged from a square inch of infected leaf surface, and that a single dead leaf may produce from 50,000 to 100,000 spores. As the perithecia do not all mature together, a single leaf may continue to discharge its spores for some time. It is clear that, with suitable conditions, the fungus is in a very good condition to produce infection in the unfolding flowers and leaves for probably a month or more. That the supply of moisture is the chief controlling factor has been clearly shown this season in New South Wales. During the time of blossoming and the setting of the young fruit we had frequent rains, alternating with warm, humid days. As a result of this plentiful supply of moisture, in conjunction with suitable temperatures, there has been an extensive outbreak of scab on the flowers and developing fruit.

The ascospores mature about the time the blossoms are opening, and on germinating they produce a tube which is able to pierce the cuticle, and then commence to grow in the tissues, usually spreading quite near the surface. As a result of this spring infection, the fungus mycelium grows in the leaf, and is soon found between the cuticle and epidermis and also beneath the epidermis. In the fruit, the cuticle and epidermis are soon broken and disappear, as the spot becomes scabby. The fungus may become many layers thick, and dark in colour. It produces erect threads, known as conidiophores, from the ends of which conidia are produced (Fig. 16). As soon as one conidium is separated off another forms, and this process continues. This is the stage known as *Fusicladium dendriticum*. These conidia germinate readily, and continue the infestation of fresh leaves, and perhaps, under very favourable conditions, of the fruit, although this latter appears exceptional.

The conidia apparently act chiefly to spread the infection on the leaves. The scab on the fruit arises from infection by ascospores, early or late scab infections being due to varying moisture conditions.

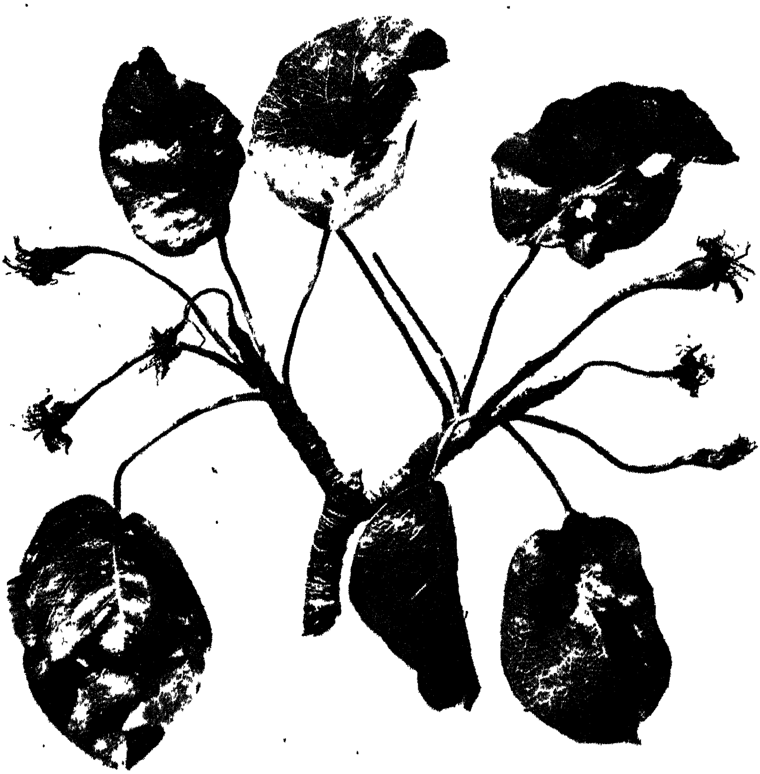


Fig. 13.—Early infection with scab. Flower stalks and leaves of the pear. The blackening and shrivelling of the flower stalks is noticeable.

FUNGUS AND OTHER DISEASES OF THE APPLE AND PEAR.

Fig. 14.—Pear leaf, under surface, showing black patches, due to early scab infection.

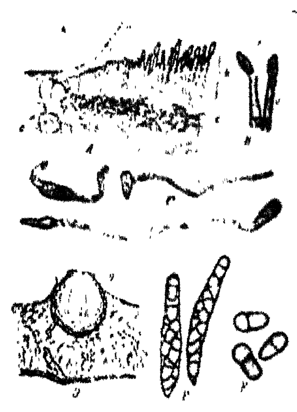


Fig. 16.- The Apple Scab Fungus.

A. Portion of a section through a scab spot on an apple.

b Fungus threads spreading under and lifting the cuticle.

a and *c* Partly disorganised cells of the apple.

e Healthy cells of the apple.

B. Two spore-bearing stalks, giving rise to summer spores.

C. Spores germinating.

D. Portion of a section through an affected leaf of an apple which has lain on the ground over winter, and has given rise to the winter-spore stage of the disease.

g Spore case, containing a bundle of spore sacs.

E. Two spore sacs more highly magnified, each containing eight two-celled winter spores, three of which are shown at *F*.

All highly magnified, after Longyear.

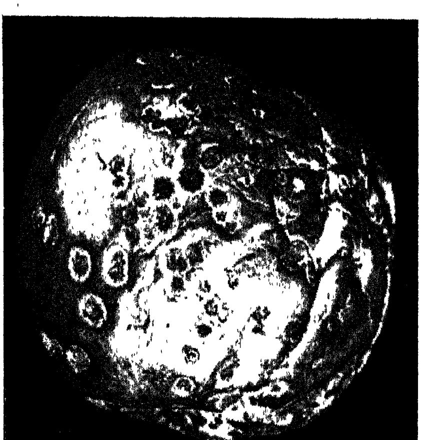


Fig. 15.—Scab on the apple, early stage, showing distinct spots, with a whitish margin.

FUNGUS AND OTHER DISEASES OF THE APPLE AND PEAR.

With the knowledge of various important stages of the life history of the fungus, we are in a better position to combat the disease. To remove the great source of infection, it is advisable to plough in all fallen leaves when these are shed; any that cannot be ploughed in should be raked up and burned. In the ground they will rot, and thus help to prevent the perithecia from properly maturing. The working of the ground in spring helps very much to scatter the spores from the disturbed leaves if they have not been ploughed under. For some time previous to, and also after, flowering time the less the surface is worked the less the spores will be scattered by leaves that bear perithecia.

The next object is to prevent those spores that are carried on to the flowers and leaves from producing infection. This is done by spraying. Bordeaux mixture and lime-sulphur both appear to be effective, provided the sprayings are done thoroughly and carried out at the proper times. Three sprayings are necessary. The first application should be made, with winter strength, when the buds are beginning to show colour; the second, with summer strength, when all the petals have fallen; and the third, also summer strength, about three weeks later. The methods of preparing Bordeaux and lime-sulphur have already been published in the *Agricultural Gazette*, and leaflets on their preparation and use may be obtained on application to the Department.

Some varieties of apples are more resistant than others, and it may be advantageous to grow these in badly affected orchards.

Among those that appear *susceptible* are:—Ben Davis, Cleopatra, Delicious, Esopus Spitzenburg, Gravenstein, Irish Peach, Maiden's Blush, McIntosh Red, Dunn's (Munroe's) Favourite, Newtown Pippin, Northern Spy, Pomme de Neige, Ribston Pippin, Rokewood, Scarlet Nonpareil, Stone Pippin, Sturmer Pippin, Twenty Ounce, Winesap, Winter Pearmain, and Yates.

Those apparently *least affected* are:—Alexander, Baldwin, Cox's Orange Pippin, Duchess d'Oldenburg, London Pippin, Grimes, Hoover, Jonathan, Reinette de Canada, Rome Beauty, Rymer, Statesman, Wealthy.

Scab of Pears (*Venturia pyrina*, Aderh).

This is very much like Apple Scab, and is due to a fungus, *Venturia pyrina* (Aderh), whose life history is similar to that of the *V. inæqualis* of apples, but it appears to attack the pear twigs more frequently than the allied fungus does the apple twigs.

Treatment is similar, but as pears are a little earlier in flowering than apples, the ascospores of *V. pyrina* mature at a correspondingly earlier period.

The following pears appear to be the *most susceptible*:—Williams, Beurre Bosc, Beurre de Capiaumont, Citron de Carmes, Vicar of Winkfield.

Those *least susceptible* apparently are:—Broom Park, Gansel's Bergamot, Kieffer, Josephine de Malines, Howell.

The question is sometimes asked, are Pear Scab and Apple Scab one and the same disease? They do not appear to be so, and it is doubtful whether, if the disease were present on a pear tree, it could affect adjacent apple trees. This is no excuse for allowing the disease to remain on a pear tree, however. The attempt should be made to stamp out every disease, even if only slightly apparent, for under suitable conditions it may extend and become extremely virulent.

Black Rot (*Sphæropsis malorum*, Peck).

This disease is usually most conspicuous on the fruit, especially at the flower end, but it also causes spots on the leaves and produces cankers on the limbs. Apples, pears, and quinces are attacked, and the fungus appears to be spreading in New South Wales, especially on the apple. Generally the rot is first noticed on the fruit as a brown spot, beginning at the bud end. The spot spreads, and may involve the whole fruit (Fig. 17). There is not so much shrinkage of the tissue at first as in Bitter Rot, and this fact, together with the absence of the pinkish masses of spores, serves to distinguish the two. The brown spot becomes darker on the older part, and covered with minute black pimples. These may begin to appear when the spot is quite small, or may not appear until the whole fruit is affected. The pimples are the pycnidia, which contain very numerous spores (Fig. 18). In the normal form these spores are oblong or elliptical, brown, and thick walled, but we have found a great amount of variation in shape and colour and in their sometimes being septate—that is, divided into two cells by a cross-wall or septum. On many twigs we have found pycnidia either separate or grouped together, in all respects like *Sphæropsis*, but containing spores that are practically all two-celled, or one septate, and very dark brown, but about the same size as *Sphæropsis* spores. According to our present methods of classifying fungi, this is probably a *Diplodia*, yet it occurs on apple and quince twigs in orchards where we have found *Sphæropsis*, and its effects on the twigs are similar. Variations in the spores of *Sphæropsis* have been recorded by several workers in America, and Messrs. Griffon and Maublanc have described a species of *Diplodia*, closely resembling ours, that attacks branches of apples and pears in France. Whether these forms are all variations of one fungus will take some considerable time to determine, but from the practical point of view their life history and methods of prevention are the same.

Photographs of twigs bearing both forms and sections of the pycnidia are shown in Figs. 18, 19, and 20. The spores retain their vitality for a long time dried, germinating even after a year's storage.

Diseased fruit may dry and wither, forming mummies (Fig. 17). Ripening fruit is most generally attacked, but green fruit injured in any way, *e.g.*, by such insects as codlin moth, &c., often becomes infected. We have collected apples less than an inch in diameter showing attack by this fungus alone.

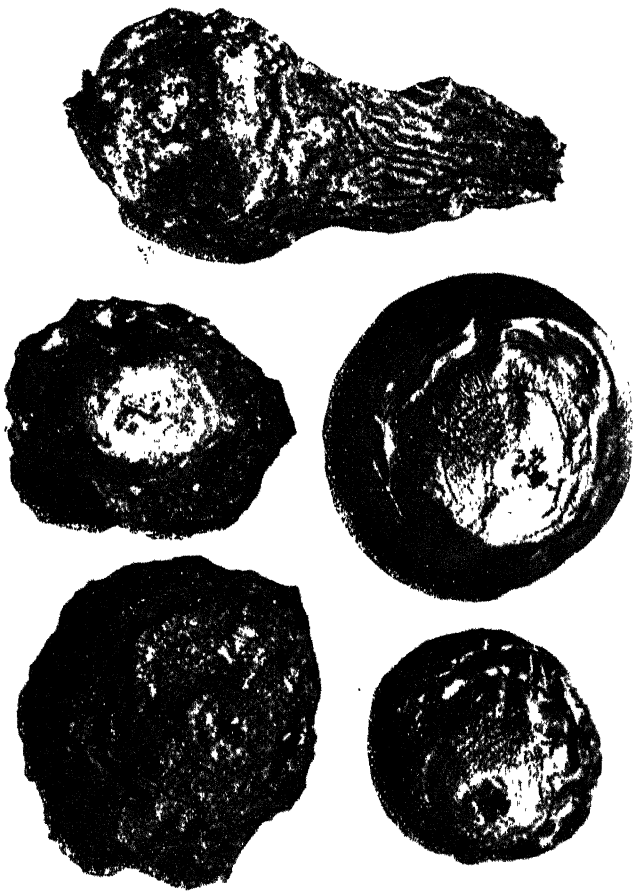


Fig. 17.—*Sphæropsis malorum.* Two apples on the right, showing the disease spreading from the calyx end. Two apples on the left, and a pear, showing the effect of the disease in producing "mummies."

FUNGUS AND OTHER DISEASES OF THE APPLE AND PEAR.

Fig. 18.—*Sphæropsis malorum.* A single black pimple (pycnidium) in section, showing the numerous spores which are borne on short stalks—the conidiophores. Around the pycnidium, and passing from it into the pulp of the apple, the fungus threads may be observed.

Fig. 19.—A group of pycnidia upon apple-tree bark. Section showing the two-celled spores (*Diplodia*) within.

a c b a

Fig. 20.—Apple twigs attacked by various fungus diseases, showing the similarity of the naked-eye appearance of the pycnidia.

(*a a*) Twigs attacked by *Sphæropsis malorum.*
(*b b*) Twigs attacked by a *Diplodia.*
(*c*) Twig upon which both *Valsa* and *Cytospora* are present.

FUNGUS AND OTHER DISEASES OF THE APPLE AND PEAR.

Fig. 21.—Early stage of canker upon apple branch produced by *Sphæropsis malorum* (from Duggar, after Whetzel).

Fig. 22.—Apple leaves, showing leaf-spots produced by natural infection of *Sphæropsis malorum* (after Scott and Rorer).

On the leaves (Fig. 22), reddish brown spots are produced, circular or irregular in outline, with a slightly raised purplish border. These spots may run together, and so destroy much of the leaf tissue, thus interfering with the functions of the leaf.

The fungus attacks the twigs and branches, producing cankers. In the mildest form this may result in only a roughening of the bark (Fig. 21), but in the most serious cases it destroys the bark, well-marked depressed areas being developed, and the wood may be exposed, or extensive wounds may result (Fig. 23). The larger limbs are more commonly affected than the twigs, and it often happens that the fungus completely girdles the limbs, thus sooner or later killing them. Limbs that suffer from sunscald appear to be particularly liable to attack, and cankered areas with their discoloured and ruptured bark often closely resemble sunscalds, and probably the two conditions are confused. Varieties that are susceptible to sunscald are also subject to *Sphæropsis, e.g.,* Spitzenburg, Twenty Ounce, and Baldwin are recorded as being very susceptible. Kieffer's pear is said to be susceptible, but in New South Wales we have, up to the present, recorded it on Williams only (Fig. 24).

The fruiting bodies (pycnidia) occur abundantly on dead twigs, leaves, and fruit, and these are the most probable source of infection from year to year. Thus particular attention should be given to cleaning up the orchard. All cankers should be cut out, or, if on large limbs, carefully scraped and painted over, or treated with Bordeaux paste, made by mixing 1½ lb. copper sulphate and 1 lb. lime with 2 gallons of water. No mummied fruit should be left hanging on the trees, and all dead material under the trees and all prunings should be collected and burned. Winter spraying with Bordeaux mixture (winter strength) is recommended. Experiments have shown that Bordeaux is more effective than lime-sulphur in the control of this disease.

In America it has been noted that the susceptibility of the varieties varies, but the following are noted:—

Very susceptible: Northern Spy, Esopus Spitzenburg, Ben Davis, Newtown Pippin, Grime's Golden.

Moderately susceptible: Twenty Ounce, Rome Beauty, A. I. Greening, Baldwin.

Slightly susceptible: Winesap, Wealthy, Jonathan, Maiden's Blush.

Valsa and Cytospora.

At various times we have examined specimens of apple twigs and branches, ranging from about quarter-inch to over an inch in diameter, affected with *Valsa* and *Cytospora* (Fig. 20). The latter form is the commonest, and is the pycnidial stage of the *Valsa,* which is the ascigerous or perithecial stage. The fungus grows beneath the bark, and may cause the death of numerous limbs. A closely allied species causes serious damage to stone-fruit trees, especially the peach and cherry, in America and Europe. As the fungus matures, the pycnidia (*Cytospora* stage) are formed, and the

bark becomes raised and ruptured, and readily peels off, the pycnidia often showing as circular raised warts (Fig. 25). The interior is divided into a number of chambers or loculi (Fig. 27), and from all the surfaces great numbers of minute bean-shaped spores are produced. Later in the season, the ascigerous stage (*Valsa*) is formed, the perithecia being well immersed in the tissues, and the minute ascospores escape through the long necks, which reach to the surface (Fig. 28). Thus the fungus is well protected, and sprays are ineffectual in its control.

These fungi are associated with forms of die-back, canker, sun-scald, and frost injury, and are probably wound parasites. The vigour and vitality of the tree determines to a great extent the amount of injury produced.

Many trees of Winter Pearmain and Carpenter's Nonsuch, 10 to 12 years old, have been attacked, while Northern Spy, growing alongside, has been unaffected.

As a means of controlling these attacks, severe and frequent pruning of all dead twigs is recommended, and all possible means should be employed to keep the trees in a thoroughly vigorous condition.

Spray Injury.

A good deal of literature is in existence upon the subject of injury done by sprays. The matter has been the subject of special investigation by U. P. Hedrick, and by H. S. Reed, J. S. Cooley, and J. T. Rogers.* We cannot do more than briefly summarise here the points that have been elucidated. The sprays most generally used for fungi in the apple orchard are Bordeaux mixture and lime-sulphur. Leaflets on the best method of preparing and applying these sprays are obtainable from the New South Wales Department of Agriculture. As regards lime-sulphur it may be pointed out that the *method of preparation is all-important*, the substances obtained in solution depending upon the amount of lime, sulphur, and water used and the length of time they are boiled. Subsequent testing with a Beaumé hydrometer will give the density of the solution and an indication of the amounts of soluble substances in the water, but it will give no indication as to what the substances are—they depend upon the method of preparation. The spray solutions commonly used for combating the pests of the orchard are poisonous substances, and their value lies in this fact. They are designed to kill fungi in the tender young stages, and consequently to eradicate them or hold them in check regular spraying is essential. The object should be to cover every part of the fruit, leaves and twigs with the fine deposit left when the liquid portion of the spray has evaporated. When a fungus spore germinates it puts out a delicate filament which must grow to a greater or lesser distance on the plant before it penetrates into and develops within the plant. In the young stages it is possible to apply a

* Bulletin No. 287. New York Agric. Expt. Station, Bordeaux Injury. U. P. Hedrick; Virginia Polytechnic Institute, Foliage Diseases of the Apple. H. S. Reed, J. S. Cooley, and J. T. Rogers.

Fig. 23.—Late stage of canker upon apple tree produced by *Sphæropsis malorum*, the main stem almost girdled at the point of origin of the branches.

Fig. 24.—Williams pear attacked by *Sphæropsis malorum* at the calyx end. The numerous

Fig. 25. Fig. 26.

Fig. 25.—Apple branch, with the ruptured bark peeled off, showing below the wart-like pycnidia of the fungus *Cytospora*.

Fig. 26.—Bark of apple tree affected with sun-scald.. [See *Agricultural Gazette*, December, 1914, page 1039.]

poison strong enough to kill this delicate filament from the sprouting spore, and weak enough, usually, to avoid injury to the plant. The killing of the sprouting spore is the main object of spraying.

1. In spring, when the leaves of certain varieties are quite tender, they may be dwarfed by spray injury. Lime-sulphur is especially apt to cause dwarfing of the leaves.

2. Owing to the position of a leaf the spray may all run down to the one side of the leaf or to its apex, and result in a side or apex injury. This result may even be brought about after the time of the spraying through rain or heavy dew dissolving the poisonous agents and always carrying them to the same portion of the leaf, owing to the position in which it

3. A general "scalding" effect may be noticed, especially when warm, moist weather follows the application of spray material.

4. "Spotting" is especially liable to be caused by Bordeaux. The dead spots (Fig. 29) produced are sometimes very similar in size and appearance to those produced by fungous diseases. The injured leaves are found most often on varieties that have smooth or slight waxy foliage, which repels the film of spray liquid and facilitates the collection of the spray into drops, where it concentrates and causes the injury. Spray injury of the "shot-hole" type is sometimes encountered.

5. Bordeaux injury is known under several names, as "spray injury," "Bordeaux scald," "Bordeaux burning," "spray russeting," "cork russeting," and "yellow leaf."

6. It has sometimes been claimed that russeting only occurs when the Bordeaux mixture is deficient in lime, but this is not true.

7. The amount of injury done to a given variety seems to depend—(*a*) upon the specific susceptibility of the plant, (*b*) upon the solvent properties of the cell sap upon the copper hydroxide, (*c*) upon the permeability of the epidermis of the plant, and (*d*) upon the weather conditions following spraying.

8. With Bordeaux mixture injury on the fruit first appears as small, round, black or brown specks. Later the injured specimens become rough and russeted, because of a ruptured epidermis and layers of dead cork cells (Fig. 30). Badly injured specimens are always more or less distorted through shrinkage of the injured portions, and may show knobby malformations, or rough, sunken scars.

9. Bordeaux mixture has a particularly harmful effect on the apple blossom, killing the tissues of the floral organs.

10. The chemistry of Bordeaux mixture, though seemingly simple, is somewhat complex. The compounds formed vary greatly with the proportions of the ingredients used and the conditions under which the mixture is made. After being sprayed on the leaves the mixture changes greatly under the influence of moisture. Wet weather gives the favouring atmospheric condition for "Bordeaux injury."

11. Russeting is almost entirely due to the application of Bordeaux mixture just after blooming. It has been suggested that lime-sulphur should be used for the first spraying and Bordeaux for subsequent spraying.

12. The most common cause of lime-sulphur spray injury is a too heavy application, the use of a nozzle which throws a coarse spray, or holding the nozzle too long in one place.

13. Lime-sulphur scald is usually, but not always, marked by a hard reddish-brown spot from ½ to 1 inch in diameter on the side of the apple exposed to the sun. In most cases the sound flesh does not crack away from the scalded area.

14. Apple Scab and similar diseases cause far greater loss than any spray injury; the use of sprays in keeping pests in check cannot be given up.

Frost Band.

It sometimes happens that apples (and pears) when slightly larger than a big marble show around the eye end a russeted skin with corky flakes upon it. The russeted area may extend outwards from the eye end as far as the middle of the apple. More rarely the skin around the eye end and around the stalk end is normal, while a band of russeted skin girdles the intermediate portion. This form of injury has been attributed, we think erroneously, to a fungus, *Coniothecium sp.* The injury is no doubt really attributable to the effects of frost upon the fruit when it is extremely young.

A freezing of the calyx end shortly after the fruit has set may cause, not only discolouration of the skin, but a deformity, although the apples may afterwards grow to almost their full size. If the frost is sufficiently severe to reach the core, and to cause the young pips to turn brown, then there is no further growth of the apple.

Chlorosis.

The leaves of apples may sometimes show numerous small white or yellow specks upon them. Sometimes yellowish-white blotches appear all over the leaves. Occasionally one-half of a leaf may be almost entirely without colour. The blotchy appearance of the leaves has given rise to such names as "apple-leaf blotch" and "Mosaic disease." The name "Chlorosis" signifies that the leaves are a lighter green than usual.

The appearance of the white spots in the leaves is not due to the presence of any fungus or bacterial parasite, but it is an indication that some necessary constituent of plant food is lacking. In order that a plant may form its green colouring matter, or chlorophyll, it is necessary that it should have at least a small quantity of iron; in the complete absence of an iron salt it fails to turn green. In New South Wales soil, however, the complete absence of any iron salt is not likely to be encountered, and the possible origin of Chlorosis on this account may generally be dismissed. Chlorosis may be brought about by other causes, viz., by drought, by excess of lime in the soil, and by lack of soluble phosphates.

Fig. 27.—Section of pycnidium of *Cytospora*, showing the numerous irregular spaces (loculi) within. The very minute spores are borne upon the inner walls of the loculi. The spore-bearing surface is thus very great.

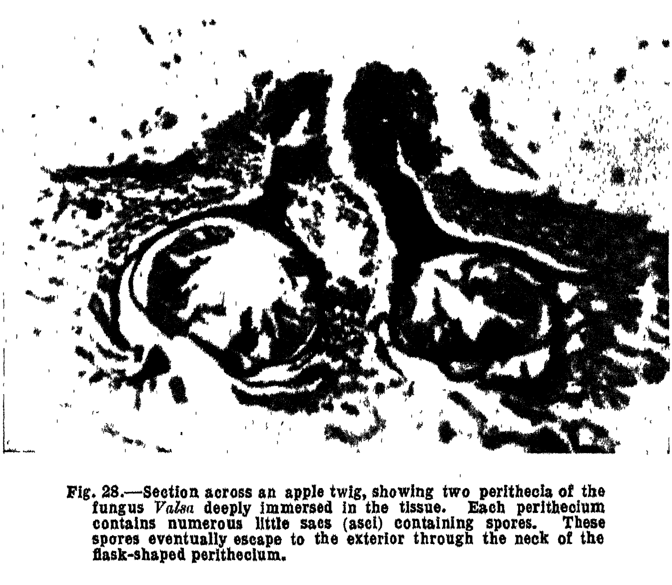


Fig. 28.—Section across an apple twig, showing two perithecia of the fungus *Valsa* deeply immersed in the tissue. Each perithecium contains numerous little sacs (asci) containing spores. These spores eventually escape to the exterior through the neck of the flask-shaped perithecium.

Fig. 29.—Dead spots produced upon an apple leaf through injury by Bordeaux mixture.

Fig. 30.—Apple showing scars and russeting, produced through injury by Bordeaux mixture.

FUNGUS AND OTHER DISEASES OF THE APPLE AND PEAR.

Drought can be met by irrigation; excess of lime in the soil cannot be removed, but lack of soluble phosphates can be easily overcome by the application of artificial manure. The fact that phosphates are frequently not present in sufficient quantity in this State suggests their use as the most likely remedy. The manure generally recommended for apple trees is:—

Bone dust	5 cwt.
Superphosphate	2½ cwt.
Sulphate of potash	2½ cwt.
	10 cwt.

Applied at the rate of 4 lb. per tree. Where Chlorosis makes its appearance, the amount of superphosphate applied may be considerably increased.

Alteration of "Statistical" Year.

The Government Statistician (Mr. J. B. Trivett) wishes it to be known that, wherever possible, but particularly in regard to production statistics, he has decided to alter the "Statistical" year, and that in future the details of Manufactories and Works, and of Agricultural, Pastoral, and Dairying production, will relate to the year ended 30th June instead of the 31st December as in the past. The advantages of the change are obvious, because our primary industries (wool, butter, wheat) are seasonal, and the calendar year takes in the end of one season and the commencement of another, while under the new plan the results of the whole of each season will be included in the year to which it rightly belongs.

The immediate effect of this decision will be that the collection which was always made by the police in January and February will be made in July of this year, when particulars of the twelve months ended 30th June, 1915, will be collected. The latest available information is up to 31st December, 1913, and, except in regard to butter factories and wool production, no information will be collected concerning the six months ended 30th June, 1914.

As bearing on this question, it may be mentioned that the Commonwealth Government has decided to compile the next year's trade returns for the year ended 30th June, 1915, and all subsequent trade years will end on 30th June.

The Treatment of Balanitis in Sheep.

Results at Nyngan Demonstration Farm.

Last August the Manager of the Nyngan Demonstration Farm called the attention of the Chief Inspector of Stock to the fact that a number of the sheep were suffering from an ailment known locally as "Pizzle disease." It usually occurs only among wethers, but quite a number of the young rams at the Farm were suffering from the complaint.

In his reply, the Chief Inspector of Stock referred to the article on "Balanitis in Sheep," by Stock Inspector Woollett, of Cobar, in the *Agricultural Gazette* for March, 1912, and recommended treatment with either of the following:—

Copper Sulphate Solution, 2 per cent.; or,
Boracic Acid Solution, 5 per cent.; or,
Common Salt Solution, 10 per cent.

In the more advanced cases it was recommended that, in addition to the above treatment, the sheaths should be washed out with a warm solution of Permanganate of Potash, 1–500, using an ordinary human enema pump.

In reporting the result of the treatment, Mr. E. A. Elliott, Stock Assistant, states:—

The operation of shearing cured a large proportion of cases, as was found when they were brought to the yards two weeks after being shorn. Eighteen were found to be very bad, and were treated as follows:—First, the prepuce was squeezed to remove all pus, which was present in nearly every case. The sheath was then washed thoroughly, both inside and out, with a 2 per cent. warm solution of Lysol and water, a small glass enema syringe being used.

They were next treated in the same way with a 2 per cent. solution of copper sulphate (bluestone). Four days later they were brought to the yard, and pus was squeezed from inside the sheath of each one. A week after the first treatment seven were found to be completely healed. Pus was present inside the sheath of four of the remainder, and all had various-sized scabs on the end of the sheath. They were treated as before with 2 per cent. Lysol and 2 per cent. copper sulphate solutions. Another week later only three required treatment, the others being healed. One of these three was also healed in a few days' time.

It was noticed that the apertures in the other two were very small, and did not allow all the pus and liquid to drain away. As the treatment did not seem to be effective with these, a different course was followed. With a sharp knife the opening of the prepuce was slit until all the pus could easily come away. The wound was then given a good wash with 2 per cent. Lysol. After being treated with the Lysol several times, at intervals of three days, the cuts healed up.

All the worst cases were found to have a small tuft of wool, which had been left at shearing time, growing round the aperture. Also, in the very bad cases, the opening was found to be smaller than usual.

Therefore, it would appear that shearing the belly, taking care to remove all the wool round the pizzle, will cure a large percentage of cases. For any that do not heal after shearing, the treatment outlined is suggested. It is never advisable to slit the pizzle unless in very bad cases, when the other treatment has failed.

In commenting on the success of the treatment, the Sheep and Wool Expert remarks that it should be made clear that the shearing of the belly should not include the removal of the long straight hairs growing from the end of the sheath. These should not on any account be clipped, as they serve as a means of draining the aperture, thus relieving it of all deposited urine.

Autumn Fodder Experiments.

WESTERN DISTRICT, 1914.

W. R. BIRKS, B.Sc. Agric., Inspector of Agriculture.

EARLY last year plots for the trial of autumn and winter fodder crops were established in six centres in the west, on the farms of the undermentioned gentlemen:—

Mr. R. G. Barnard, "Hurcott," Wyanga, Narromine District.
Mr. H. J. Clements, "Curraweena," Brundah, Grenfell District.
Mr. J. Franks, "Clear Hills," Tichbourne, Parkes District.
Mr. W. Moss, "Hillview," Coradgery.
Mr. J. W. Lithgow, "Wattlegrove," Gilgandra.
Mr. D. A. Rich, "Rozelayne," Wellington.

The general plan of experiment adopted may be indicated thus:—

1·5 acres rape, 4 lb. seed per acre.
1·5 „ „ 8 lb. „
1·5 „ „ 3 lb., and Skinless barley, 15 lb. seed per acre.
1 acre field peas, 1 bus. seed per acre.

The first three plots in each locality were sown late in February or early in March, and the planting of the peas was delayed until three to four weeks later. The ordinary grain drill was used for planting, and 56 lb. of superphosphate per acre was applied throughout. In the case of the rape the seed was mixed with the manure in small quantities immediately prior to drilling. In plot No. 3 the rape and barley were sown in alternate drills by blocking every second cup in the seed-box (for the barley), and removing the alternate stars in the manure-box, the spindle holes thus left open being blocked with small pieces of rag.

Cultivation and Cost.

The preparatory cultivation given was much the same for each plot. Land which had carried wheat in 1913 was selected, and the stubble turned in with the one-way disc cultivator in January. In cases where the ground was subsequently "set" by rain the disc was again used immediately before drilling, but in some cases a harrowing at this time was sufficient. The cost of putting the crop in was thus reduced to a minimum, and may be represented approximately per acre by the following items:—

	s.	d.
First discing	2	6
Working prior to seeding	1	6
Drilling	1	6
Manure	2	6
Seed	2	0
Total	10	0

While dealing with expenditure it may be well to point out that, although the direct return in the form of grazing was very generous on the whole for so small an outlay, an indirect return in the form of assistance to the following crop is also looked for. The object in view was to have the land fallowed at the end of the winter when the crops were eaten down, and where this was done in August and September the experimenters remarked upon the mellow and workable condition of the ground. Thus had the crops themselves been a failure, the present excellent condition of the fallow, as compared with other ground broken at about the same time, indicates that the original outlay in the early working would not have been entirely lost.

The Season.

The season was, generally speaking, favourable to early autumn growth, particularly so at Gilgandra; and in cases in which it was found possible to sow immediately after rain, the crops came away well and made good growth until about the end of June. In one or two cases, notably at Tichbourne, where rains were not so favourable, it was thought advisable to sow in dry ground rather than to wait longer. This, however, proved a risky procedure that should in practice be avoided, for heavy rain fell shortly after planting and set the surface and hindered the germination of the small rape seed. From this check the crop did not thoroughly recover, and, consequently, the results at this particular centre did not appear to justify the expenditure involved.

Elsewhere the crops made good growth after the first fall of rain, and were fit to feed off in from six to eight weeks' time. As it was desired, however, to arrive at an estimate of the ultimate relative growth each section of the plots would make, they were left until early June before the stock were turned in. This again involved a certain amount of loss, as by the time this first feeding off was complete—about mid-July—the dry spell which covered the late winter and spring of the season had already set in, and in the absence of rain no considerable second growth could be expected. What little did appear was badly affected with aphis. Had the crops been fed off early in May, as would be done in general practice, a good second growth might have been expected as a result of the June rains.

Disposal of the Crop.

In setting out the results obtained from such crops as are here dealt with, it is, of course, difficult to arrive at definite figures. An attempt was made, however, to determine approximately the grazing value of each set of plots as a whole, by keeping a record of the number of stock run on the area, and the time during which they were wholly supported thereon. All classes of stock were used, but for the purpose of comparison, the total grazing value was reckoned up in the equivalent of sheep. Thus, aged large stock were regarded as being equal to five sheep, and yearlings, &c., as equal to two or three sheep, according to size. The equivalent of sheep thus calculated was noted each day during the grazing period. At the end of the season the number of "sheep days" was totalled, and the results stated below are

computed on the supposition that the areas were stocked uniformly at the rate of ten sheep per acre As a matter of fact, some of the plots were carrying thirty to forty sheep per acre at times.

Results.

With regard to the relative value of the crops employed, little of a definite nature can be said. On the whole, the thin-seeded rape appeared to make the heaviest growth. The plot planted with 8 lb. of seed, as was to be expected, was too crowded and grew less vigorously. The season, for some not very apparent reason, did not favour the barley, and, on the whole, the mixed plot was hardly as good as the rape alone, though it was noticed that (after the peas) the sheep ate out this plot first, and it seemed to introduce them gradually to the rape. The success of the peas varied greatly in the different localities, depending apparently on the conditions at seeding time.

The grazing results, notes on growth, and other details are set out separately. for each locality. The rainfall is for the period February to June, inclusive.

Wyanga.—Sown, 18th February. Soil, red and blackish friable clay. Rainfall, 6·82 inches. All plots made good growth; the peas covered the ground well; rape stood up to 9 inches and barley 1 foot in height. Owing to absence of suitable fences it was impossible to feed these plots off; a certain amount of rough dry feed was cut from them, and the residues were ploughed in during August.

Brundah.—Sown, 20th February. Soil, light whitish loam Rainfall, 7·26 inches. Peas (sown 23rd March) were very poor; other plots made uniformly good growth—rape and barley standing 1 foot to 15 inches high. Fed off, 14th July to 17th September. Total grazing, equivalent to 10 sheep per acre for 8½ weeks.

Tichbourne.—Sown, 3rd March. Soil, heavy red clay loam. Rainfall, 7·20 inches. As indicated above, the crop in this case could not be considered a success, owing to the ground setting before germination. The peas (sown 25th March, after rain) did well, and practically covered the ground to a depth of 6 to 9 inches. Fed off in June. Total grazing, equivalent to 10 sheep per acre for 5 weeks.

Gilgandra.—Sown, 10th March. Soil, light loam, riverside country. Rainfall, 11·26 inches. All plots here made exceptionally good growth; the rape in the better patches stood up to 3 feet 6 inches high, and the whole crop was very dense. A small area cut out and weighed, yielded at the rate of 20 tons of green stuff per acre. The peas completely covered the ground to a depth of 1 foot to 18 inches, and the haulms when lifted reached to a height of 4 feet 6 inches. Fed off, 27th May to 26th August (including a short second grazing). Total grazing, equivalent to 10 sheep per acre for 19 weeks.

Coradgery.—Sown, 5th March. Soil, red sandy loam. Rainfall, 6·65 inches. All the plots made very good growth indeed; the peas covered the ground well, and the rape and barley stood from 18 inches to 2 feet high. Fed off in June and July. Total grazing, equivalent to 10 sheep per acre for 14 weeks.

Wellington.—Sown, 24th February. Soil, light whitish loam. Rainfall, 10·27 inches. The peas (sown 9th April) practically failed; otherwise the plots all made good growth. Rape stood from 9 inches to 1 foot high A considerable amount of self-sown wheat came also in these plots. Fed off, 27th May to 13th July. Total grazing, equivalent to 10 sheep per acre for 10 weeks.

Conclusions.

The results may be summarised in this way:—During the last season, on a farm carrying 500 sheep and situated in the districts covered by these trials, 50 acres of autumn fodder crops planted, say, in two separate paddocks, would have supported the flock during the months of May, June, and July and the ordinary grass land could have been given a correspondingly thorough spell.

It may be pointed out that, although the past season was an extremely trying one for most farmers concentrating their efforts on wheat-growing, yet over a great part of the Western Slopes, at least, both the autumn and late spring rains were good. Consequently, on those few farms on which provision is made for stock in the form of special crops for grazing, an abundance of feed was available for all stock during the autumn and early winter. And again in November and early December summer fodders, such as sorghum and corn, had already made luxuriant growth. Had, therefore, a better balance as between wheat-growing pure and simple and stock-raising been more generally established in the district, there is good reason to believe that the severity of the season would not have been half so keenly felt.

The Market for Seed of French Beans.

In reply to a South Coast correspondent, who asked whether there is a market for French beans, threshed, Mr. A. J. Pinn, Inspector of Agriculture, wrote that there is always a good market for seed of the Canadian Wonder. The bulk of the seed used in this State is imported from Victoria, which has the reputation of producing a sample equal to anything in the world. A cool climate is necessary to the successful cultivation of the crop for seed.

During the past few years, and especially during the present season, owing to the partial failure of the Victorian crop, prices have been very high. This year they have been over £1 per bushel, whereas a few years back contracts were executed at 10s. per bushel. The threshing is done with either a flail or a bean-thresher.

Annual Reports of Demonstration Areas, 1913-14.

GLEN INNES EXPERIMENT FARM.

R. H. GENNYS, Manager.

THE rainfall for 1913 (January to December) was 33·26 points, which was 2 inches above the average for the last four years. The season was mild, and slight frosts were experienced during the middle of October. The driest months were August (60 points) and November (161 points).

A very wet harvest was experienced—over 11 inches of rain falling from 12th December, 1913, to 12th February, 1914, on 23 days, with two very heavy hailstorms during December and January, which did considerable damage to the grain crops.

In the following statements the rates quoted are *contract* rates, obtained from local farmers, and should not be confounded with the local daily rates whereby most of the operations are done and which work out about 25 per cent. less on most operations and increase the farmers' profits to that extent.

The ordinary farmer, who performs his own operations would, of course, receive the amounts shown opposite the various operations in addition to the net profits shown.

Agistment has been credited at the rate of six-tenths of a penny per sheep per week, this being the average agistment for sheep charged in the Glen Innes district during the season under review. There was a con siderable quantity of self-sown oats, as the grain was shelled by hail, &c.

In the summarised reports of the actual farm figures, which are given under the detailed statements in each case, debits are made for all the operations, seeds, &c., enumerated in the above-mentioned statements, at the actual cost, or, in the case of seeds grown on the farm, at the valuations given below, also for rent at 8s. per acre (5 per cent. on capital value of land), and wear and tear at 2s. 6d. per acre. In addition to the above, charges are made for managerial and office expenses and apprentices' labour. These latter expenses would not be incurred in ordinary farm management. Credits are given at the actual cash prices received in the case of sales and at the following valuations for produce consumed on the farm:—

	s.	d.	
Graded seed wheat	6	0	per bushel.
„ „ oats	4	0	„
„ „ maize	7	6	„
Milling wheat	3	6	„
Feed oats	2	9	„
Feed maize	4	2	„
Chick wheat	3	0	„

PADDOCK No. 1.—16 acres Algerian Oats for Hay.

Dr.	£	s.	d.	*Cr.*	£	s.	d.
To Ploughing at 10s. 3d. per acre	8	4	0	By 36 tons oaten chaff, at £4 per ton	144	0	0
Sowing with cultivator at 3s.	2	8	0	Agistment	0	15	7
Seed, 24 bushels oats at 4s. ...	4	16	0				
Harrowing, at 6d. per acre ...	0	8	0				
Binder Twine, at 2s. 6d. per acre	2	0	0				
Cutting with binder, at 5s. per acre	4	0	0				
Stooking, at 2s. 6d. per acre...	2	0	0				
Carting and stacking, at 9s. per acre	7	4	0				
Chaff bags, best second-hand, at 5s. per dozen	17	5	0				
Cutting chaff at 8s. per ton ...	14	8	0				
Cartage to rail, at 5s. per ton	9	0	0				
Rent, at 8s. per acre	6	8	0				
Balance (net profit)	66	14	7				
	£144	15	7		£144	15	7

Profit of £66 14s. 7d. or £4 3s. 5d. per acre.

Actual farm figures:—Debit, £20 1s. 10d.; credit, £126; credit balance, £105 18s. 2d., or £6 12s. 5d. per acre.

PADDOCK No. 6.—Algerian Oats (39 acres for Hay; 9 acres for Grain).

Dr.	£	s.	d.	*Cr.*	£	s.	d.
To Ploughing at 10s. 3d. per acre	24	12	0	By 61½ tons Oaten Chaff at £4	246	0	0
Cultivating at 2s. 6d. per acre	6	0	0	471 bushels oats at 2s. 9d. per bushel...	64	15	3
Drilling at 1s. 8d. per acre ...	4	0	0	5 tons straw at 15s.... ...	3	15	0
Seed, 75 bushels at 4s. per bushel	15	0	0	Agistment	35	13	3
Superphosphate, 28 cwt. at 6s.	8	8	0				
Harrowing at 6d. per acre ...	1	4	0				
Binder Twine at 2s. 6d. per acre...	6	0	0				
Cutting with Binder at 5s. per acre	12	0	0				
Stooking, 39 acres at 2s. 6d., 9 acres at 1s. 3d.	5	11	0				
Carting and stacking at 9s. per acre	21	12	0				
Grain bags, 12 doz. at 5s. 6d.	3	6	0				
Thrashing at 1s. 4d. per bag	9	12	0				
Chaff-bags, 119½ doz. at 5s....	29	17	6				
Chaffcutting at 8s. per ton...	24	12	0				
Cartage to rail, 5s. per ton...	17	10	0				
Rent, 8s. per acre	19	4	0				
Balance (net profit)	141	15	0				
	£350	3	6		£350	3	6

Profit, £141 15s., or £2 19s. per acre.

Actual farm figures:—Debit, £100 19s. 11d.; credit, £282 11s.; credit balance, £181 11s. 1d., or £3 15s. 8d. per acre.

PADDOCK No. 11.—13 acres Genoa Wheat; 18 acres White Tartarian Oats; 11 acres Algerian Oats.

Dr.	£	s.	d.	*Cr.*	£	s.	d.
To Ploughing at 10s. 3d. per acre	21	10	6	By 171½ bushels wheat at 3s. 6d. bushel ...	30	0	3
Discing at 2s. 6d. per acre ...	5	5	0	466½ bushels white Tartarian oats at 2s. 9d. bushel ...	64	2	10
Seed, 14¾ bushels wheat at 6s.	4	8	6	173 bushels Algerian oats at 2s. 9d. bushel ...	23	15	9
Seed, 43½ bushels oats at 4s.	8	14	0	18 tons straw at 15s. ...	13	10	0
Treating seed for 18 acres, at 3d. per acre ...	0	4	6				
Drilling in seed at 1s. 8d. per acre ...	3	10	0				
Binder Twine at 2s. 6d. per acre ...	5	5	0				
Cutting with binder at 5s. per acre ...	10	10	0				
Stooking, at 1s. 6d. per acre	3	3	0				
Carting and stacking at 9s. per acre ...	18	18	0				
Grain bags, 260 at 5s. 6d. per dozen ...	5	19	2				
Thrashing at 1s. 4d. per bag	17	6	8				
Cartage to rail, 15½ tons, at 5s.	3	17	6				
Rent at 8s. per acre ...	16	16	0				
Balance (net profit) ...	6	1	0				
	£131	8	10		£131	8	10

Profit, £6 1s., or 2s. 11d. per acre.

Actual farm figures:—Credit, £129 9s. 8d.; debit, £50 19s. 8d.; credit balance, £78 10s., or £1 17s. 4d. per acre.

PADDOCK No. 12A.—10 acres Haynes' Blue Stem; 5 acres Genoa; 5 acres Florence; 10 acres Thew; 1 acre Cedar.

Dr.	£	s.	d.	*Cr.*	£	s.	d.
To Ploughing at 10s. 3d. per acre	15	17	9	By 664½ bushels wheat at 3s. 6d.	116	5	9
Harrowing at 6d. per acre ...	0	15	6	15½ tons straw at 15s. ...	11	12	6
Seed wheat, 32½ bushels at 6s.	9	15	0	Agistment ...	11	19	9
Treating seed for 10 acres at 3d. per acre ...	0	2	6				
Drilling in seed at 1s. 8d. per acre ...	2	11	8				
Binder twine at 2s. 6d. per acre ...	3	17	6				
Cutting with binder at 5s. ...	7	15	0				
Stooking at 1s. 6d. per acre ..	2	6	6				
Carting and stacking at 9s. per acre ...	13	19	0				
Bags, 18½ dozen at 5s. 6d. per dozen ...	5	1	9				
Thrashing at 1s. 4d. per bag	14	15	4				
Cartage to rail at 5s. per ton	4	9	0				
Rent at 8s. per acre ...	12	8	0				
Balance (net profit) ...	46	3	6				
	£139	18	0		£139	18	0

Profit, £46 3s. 6d., or £1 9s. 9d. per acre.

Actual farm figures:—Debit, £50 19s.; credit, £129 9s. 8d.; credit balance, £78 10s. 8d., or £2 10s. 8d. per acre.

PADDOCK No. 13.—42 acres Algerian Oats for Grain.

Dr.	£	s.	d.	*Cr.*	£	s.	d.
To Ploughing at 10s. 3d. per acre	21	10	6	By 1,134 bushels Algerian oats at 2s. 9d ...	180	13	6
Seed, 84 bushels at 4s.	16	16	0	2 tons oaten chaff at £4 ..	8	0	0
Drilling in at 1s. 8d. per acre	3	10	0	15 tons straw at 15s. ...	11	5	0
Binder Twine at 2s. 6d. per acre	5	5	0				
Cutting with binder at 5s. ...	10	10	0				
Stooking at 1s. 6d. per acre...	3	3	0				
Carting and stacking at 9s.	18	18	0				
Grain bags, 36½ doz. at 5s. 6d.	10	0	9				
Thrashing at 1s. 4d. per bag	29	4	0				
Chaff bags, 4 dozen at 5s. ...	1	0	0				
Chaff cutting at 8s. per ton	0	16	0				
Cartage to rail, 25½ tons at 5s.	6	7	6				
Rent at 8s. per acre	16	16	0				
Balance (net profit)	56	1	9				
	£199	18	6		£199	18	6

Profit, £56 1s. 9d., or £1 6s. 8d. per acre.

Actual farm figures: Debit, £150 1s. 3d.; credit, £269; credit balance, £118 18s. 9d., or £2 16s. 8d. per acre.

PADDOCK No. 14. 24 acres Haynes' Blue Stem Wheat for Hay; 30 acres Algerian Oats for Grain; 20 acres Algerian Oats for Hay.

Dr.	£	s.	d.	*Cr.*	£	s.	d.
To Ploughing at 10s. 3d. per acre	37	18	6	By 1,984 bushels oats at 2s. 9d.	272	16	0
Cultivating at 2s. 6d. per acre	9	5	0	48 tons wheaten chaff at £3 11s.	170	8	0
Seed wheat, 24 bushels at 6s.	7	4	0	49 tons oaten chaff at £4 ...	196	0	0
Seed oats, 78 bushels at 4s.	15	12	0	16 tons straw at 15s. ...	12	0	0
Superphosphate, 38 cwt. 2qr. 19 lb. at 6s. per cwt. ...	11	12	0	Agistment	26	9	3
Drilling in at 1s. 8d. per acre	6	3	4				
Harrowing at 6d. per acre	1	17	0				
Twine at 2s. 6d. per acre ...	9	5	0				
Cutting with binder at 5s. per acre	18	10	0				
Stooking, 44 acres at 2s. 6d. per acre	5	10	0				
Stooking, 30 acres at 1s. 6d.	2	5	0				
Carting and stacking at 9s. per acre	33	6	0				
Grain bags, 620 at 5s. 6d. per dozen	14	4	2				
Chaff bags, best second-hand at 5s. per dozen ...	46	9	7				
Thrashing at 1s. 4d. per bag	41	6	8				
Cutting chaff, 97 tons at 8s.	38	16	0				
Cartage to rail, 132½ tons at 5s. per ton	33	2	6				
Rent at 8s. per acre... ...	29	12	0				
Balance (Net profit) ...	315	14	6				
	£677	13	3		£677	13	3

Profit, £315 14s. 6d., or £4 5s. 4d. per acre.

Actual farm figures:—Debit, £209 8s. 6d.; credit, £626 10s.; credit balance, £417 1s. 6d., or £5 12s. 10d. per acre.

PADDOCK No. 15.—30 acres Maize; 6 acres Potatoes; 4 acres Pumpkins.

Dr.	£	s.	d.	*Cr.*	£	s.	d.
To Ploughing twice at 11s. per acre	22	0	0	By 30 tons potatoes at £3 per ton	90	0	0
Harrowing twice at 2s. 3d. per acre	4	10	0	½ ton pumpkins at £2 per ton	1	0	0
Drilling maize at 2s. per acre	3	0	0	1,290 bushels maize at 4s. 2d. per bushel	268	15	0
Cultivating maize twice at 3s. 3d. per acre... ...	4	17	6				
Seed maize at 1s. 3d. per acre	1	17	6				
Superphosphate, 18 cwt. at 6s.	5	8	0				
Pulling and husking at 8s. 3d. per acre... ...	12	7	6				
Shelling at 5s. per acre ...	7	10	0				
Corn sacks, 35½ dozen at 6s.	10	13	0				
Carting maize at 5s. per ton	8	0	0				
Planting pumpkins at 2s. per acre	0	8	0				
Cultivating pumpkins twice at 3s. 3d. per acre ...	0	13	0				
Pumpkin seed (actual cost)	3	10	2				
Carting pumpkins (½ ton) ...	0	2	6				
Planting potatoes at 19s. per acre	5	14	0				
Hilling potatoes at 10s. per acre	3	0	0				
Seed potatoes at £4 6s. per acre	25	16	0				
Digging potatoes, 400 bags at 1s. per bag	20	0	0				
Potato bags, 33⅓ dozen at 10s. 10d. per dozen ...	18	1	1				
Carting potatoes at 5s. per ton	7	10	0				
Rent at 8s. per acre... ..	16	0	0				
Balance (net profit)	178	16	9				
	£359	15	0		£359	15	0

Profit, £178 16s. 9d., or £4 9s. 5d. per acre.

Actual farm figures:—Debit, £129 9s. 7d.; credit, £353 15s.; credit balance, £224 5s. 5d., or £5 12s. 2d. per acre.

The maize was drilled in with ordinary wheat drill, thus saving considerable cost in planting.

PADDOCK NO. 18A.—14 acres Genoa Wheat for Grain.

Dr.	£	s.	d.	*Cr.*	£	s.	d.
To Ploughing at 10s. 3d. per acre	7	3	6	By 354 bushels at 3s. 6d. per bushel	61	19	0
Cultivating at 2s. 6d. per acre	1	15	0	10 tons straw at 15s. per ton	7	10	0
Seed, 14 bushels at 6s. per bushel	4	4	0	Agistment	6	8	4
Drilling at 1s. 8d. per acre ...	1	3	4				
Binder Twine at 2s. 6d. per acre	1	15	0				
Cutting with binder at 5s. per acre	3	10	0				
Stooking at 1s. 6d. per acre	1	1	0				
Carting and stacking at 9s. per acre	6	6	0				
Thrashing at 1s. 4d. per bag	7	17	4				
Bags, 10 dozen at 5s. 6d. per dozen	2	15	0				
Cartage to rail at 5s. per ton	2	7	5				
Rent at 8s. per acre	5	12	0				
Balance (net profit)	30	7	9				
	£75	17	4		£75	17	4

Profit, £30 7s. 9d., or £2 3s. 4d. per acre.

Actual farm figures :—Debit, £16 13s. 10d. ; credit, £51 12s. 8d. ; credit balance, £34 18s. 10d., or £2 9s. 11d. per acre.

SUMMARY of Profit and Loss.

Paddock No.	Area in Acres.	Local Farmers' Contract Figures. Net Profit. Total. £ s. d.	Local Farmers' Contract Figures. Net Profit. Per Acre. £ s. d.	Actual Farm Figures. Net Profit. Total. £ s. d.	Actual Farm Figures. Net Profit. Per Acre. £ s. d.
1	16	66 14 7	4 3 5	105 18 2	6 12 5
6	48	141 15 0	2 19 0	181 11 1	3 15 8
11	42	6 1 0	0 2 11	78 10 0	1 17 4
12A	31	46 3 6	1 9 9	78 10 8	2 10 8
13	42	56 1 9	1 6 8	118 18 9	2 16 8
14	74	315 4 6	4 5 4	417 1 6	5 12 10
15	40	178 16 9	4 9 5	224 5 5	5 12 2
18A	14	30 7 9	2 3 4	34 18 10	2 9 11
Total...	307	841 4 10	2 14 9	1,239 14 5	4 0 9

The larger net profit from actual farm figures is accounted for by the higher prices obtained for seed grain and the cheaper methods of ploughing, four furrows being used in some cases where the ordinary farmers use two.

NYNGAN DEMONSTRATION FARM.

H. J. KELLY, Manager.

THE special demonstration area for the season 1913 comprised 100 acres, and yielded 85 tons of hay from 70 acres, and 309 bushels of seed wheat and 45 bushels of chick wheat from 30 acres.

As it is difficult to quote local rates for the different operations, owing to agricultural pursuits being undertaken only to a limited extent in the district, the actual cost of each operation is given, being the wages paid to the employees while engaged on this work, together with an allowance of 2d. per hour for each horse used.

Plant depreciation at the rate of 2s. 6d. per acre is allowed, also rent at 5 per cent. per annum on the capital value of the land, for eighteen months from commencement of fallowing operations to completion of harvest.

Management and office expenses are also allowed for at £20.

The value placed on the hay, viz., £3 per ton, is on the low side, but, as an average price, can be accepted generally as fair. The wheat and cavings were sold at the prices quoted for them, and therefore realised the exact amount stated.

TABLE showing Charges for the various operations. (Depreciation not included.)

Operation.	Cost per acre. s.	d.
6-inch disc ploughing	4	9
Cultivating spring-tooth	1	4
,, disc	1	8
Harrowing (part twice)	0	8
Drilling	1	4
Cutting with binder (70 acres)	1	4
Stooking (70 acres)	1	7
Carting and stacking hay (70 acres)	6	2
Stripping, winnowing, and carting grain (30 acres)	4	0
Bird destruction	0	6
Seed treated	2	6
Fertiliser at £4 10s. per ton	1	0
Binder twine (70 acres)	1	3
Wheat sacks (30 acres)	2	11
Sewing twine ,,	0	1
Grading and delivering grain (30 acres)	4	5
Rent, for eighteen months at 5 per cent. per annum	4	6

The seed and fertiliser were both lightly applied in the planting of this crop. The seed (Firbank wheat) was sown at the rate of 23 lb. per acre, and the superphosphate at the rate of 25 lb. per acre.

FINANCIAL Statement for the 100 acres, based upon the costs quoted.

Dr.

	£	s.	d.
To 6-inch ploughing	23	18	5
Cultivating spring-tooth (twice)	13	6	6
Harrowing (part twice) ...	3	15	0
Cultivating disc (twice) ...	13	6	6
Drilling	6	16	0
Cutting with binder (70 acres)	4	14	2
Stooking (70 acres)	5	6	4
Carting and stacking hay (70 acres)	20	19	9
Stripping, winnowing, and carting (30 acres) ...	5	19	1
Bird destruction	2	10	0
Seed treated	12	10	0
Fertiliser	5	0	0
Binder twine	4	7	6
Wheat sacks...	4	8	0
Sewing twine	0	3	0
Grading and delivering ...	6	12	7
Plant depreciation	12	10	0
Rent for eighteen months ...	22	10	0
Management and office expenses	20	0	0
Balance	169	1	3
	£361	11	6

Cr.

	£	s.	d.
By 85 tons hay at £3	255	0	0
309 bushels seed wheat at 6s.	92	14	0
45 bushels chick wheat at 3s. 6d.	7	17	6
3 tons cavings at £2 ...	6	0	0
	£361	11	6

The total profit on the 100 acres was, therefore, £169 1s. 3d., or at the rate of £1 13s. 9¾d. per acre.

FRUIT AND VEGETABLES FOR THE FLEET.

THE Government have received an appeal for fresh or preserved fruit and vegetables for distribution among the warships of the North Sea fleet, from the Vegetable Products Committee, which has its offices at Alderman's House, Alderman's Walk, London, E.C., and a receiving depôt at the Salvage Warehouse, Paddington Goods Station, London. The committee in its appeal states :—

My committee think it possible that some of your fruit producers and exporters may feel disposed to contribute some fresh and preserved fruit to this organisation (which is approved by the Admiralty and War Office) for distribution amongst the warships of H.M. fleet in the North Sea. I am therefore directed to bring the enclosed brief particulars of my committee's objects under your notice, in the hope that our work will have your sympathy and approval, and that you may be so kind as to give the enclosed particulars some publicity, in order that our objects may be brought under the notice of likely contributors.

During the past sixteen days we have despatched upwards of 900 large cases and barrels of produce to the fleet, and several parcels to army camps and military hospitals, and have received many highly appreciative letters of thanks from the officers in command, who express the earnest hope that we may be able to keep up the supply. Unfortunately the fruit season of the United Kingdom will shortly end, and then we shall have to fall back on the tinned or bottled article and imported fruits.

The large warships can store fresh fruit in bulk, but this is not possible to torpedo boats and submarines, which we hope to keep supplied with jams and preserved fruits.

Grasses and Clovers on the Murrumbidgee Irrigation Area.

A Spring Trial.

R. W. McDIARMID, Assistant Inspector.

It was not anticipated when the expeiiments referred to in this article were designed that spring sowings of clovers and winter grasses would succeed, but as many of the settlers were of a contrary opinion, the trials were arranged.

The failure of several of the varieties tried should not be regarded as proving them of no use for the Area, since in a number of cases they have succeeded there when sown in the autumn, notably so with *Phalaris bulbosa* and Prairie (*Bromus unioloides*). On the other hand, spring as well as autumn sowings of Rhodes grass are advocated; the former were quite successful in the experiments reported hereunder.—H. Ross, Chief Inspector.

To ascertain what grasses and clovers may thrive with spring sowing on the irrigation areas of Yanco, Mirrool and Hay, several varieties of each were sown during the months of August, September, and October. It is apparent even at this early stage which are satisfactory and which failures. The clovers have all proved to be unsuccessful, and most of the grasses.

The spring has been unusually dry, but this must be expected any year in this district. The absence of rain necessitated irrigating the land after sowing the seed, in order to germinate it, but although germination has been fair in most cases, much better results would have been obtained with a suitable rainfall. The irrigation had the effect of "setting" the surface soil and interfering with the best growth of the young plant. In all cases where furrowing was adopted for irrigating the germination has been better and the growth more successful.

On the Hay Irrigation Area, where the head of water is naturally small, and where irrigation must necessarily be slow, the land soaked better, and germination was as a whole much more successful than on the Yanco and Mirrool plots. The growth has also been better at Hay, but where the water was allowed on the surface in such excess as to cause baking, bare patches are in evidence.

As will be noticed from the following notes, the most successful grasses are Rhodes, Sudan, Panic grasses, Hungarian Brome and Tall Fescue.

Strawberry Clover (*Trifolium fragiferum*).

Roots of this clover were obtained from the Gippsland district in Victoria, where it thrives luxuriantly in swampy situations, and transplanted during September on the Hay, Yanco and Mirrool areas. In each case most of the roots lived but have made no growth whatever. It is of a spreading habit, but the amount of growth laterally in three months has been about 2 to 3 inches. The plants have been watered regularly and liberally each rotation, but the interval between watering appears to be far too long for successful growth. It appears to be valueless unless it would thrive in the swamps where there is water always.

Chilian Clover (*Trifolium pratense perenne*).

Seed was sown during August and September months on the areas of Hay, Yanco and Mirrool on various classes of soil. The amount of seed sown was 12 to 16 lb. per acre, and the germination in each case was satisfactory, but the growth rather disappointing. The best growth is at Hay, and even there it requires more water than can be given it. Spring sowing in this hot climate, with all the water, is not successful the first year; perhaps the growth will be better when better established. Where the settlers have sown the seed in autumn, the growth is but little better and cannot compete with lucerne.

Egyptian Clover (*Trifolium alexandrinum*).

The much talked of Berseem or Egyptian Clover has given very unsatisfactory results. The seed was sown in September at the rate of 12 lb. per acre on the Yanco and Mirrool areas, and in each case, though the germination was good, the growth has been very inferior. The plant is a very shy stooler with very scanty leaves. It has been regularly and liberally watered. Autumn sowing will no doubt prove better, but judging from the small plot at Yanco Experiment Farm, and having regard to the price of seed, and the fact of it being an annual, it has little to recommend it for the areas.

White Dutch Clover (*Trifolium repens*).

The seed of this clover was sown in with various grasses, and although the germination was good, the growth has been, like the other clovers, very inferior. In the majority of plots the plants have died out.

Rhodes Grass (*Chloris gayana*).

Seed of this grass was sown on the three areas, and it has been one of the few that grew satisfactorily. It was sown in September and October at the rate of 4 to 8 lb. per acre, according to the soil, the heavier sowing being on Farm 17, where the land is heavy and less likely to germinate the seed well. The seed was hand sown and drilled, but where broadcasted by hand, the germination has been better. The drill has a tendency to sow too deeply, which is a serious matter where it is necessary to irrigate the land after the sowing to germinate the seed.

The ordinary interval of fifteen days between waterings is too long in many instances to successfully germinate this seed, and as was done on Farm 17, a special watering was given midway between. On one plot Rhodes grass failed to come away, apparently owing to want of moisture sooner, for the seed was of good quality. Where this grass germinated well, it has made very satisfactory growth.

Phalaris bulbosa.

The germination was good in each plot, but the growth has not been very satisfactory. It will do better when better established, and especially during the cooler portion of the year. Where this grass has been established for some time on the area, the growth is not very good compared with its growth in colder climates. On channel banks, where protected from stock, it has made a growth of 3 to 4 feet, and looks very well.

Texas Blue Grass (*Poa arachnifera*).

As the seed of this grass is not procurable, roots were transplanted on each area in rows 4 feet apart. It is naturally a good spreader underground, but in this climate it has failed. The plants have remained alive, but have not made the slightest growth. Where it has been longer established on the area, and regularly watered and cultivated, the growth is very inferior.

Prairie Grass (*Bromus unioloides*).

This was sown both singly and in mixtures on Yanco and Mirrool areas, but it has made no growth. The seed germinated and plants are still alive, but not growing.

Perennial Rye (*Lolium perenne*).

The germination of this also was very rapid and good, but the growth was a failure, the hot period between waterings being too severe. It will no doubt do better during the cooler months, but much cannot be expected from it.

Tall Fescue (*Festuca arundinacea*).

The germination and growth on each plot has been satisfactory. It is hardy, and is standing fairly well, but has not made much growth yet. It should prove a useful grass unless attacked by ergot, from which t suffers in New Zealand.

Hungarian Fodder Grass (*Bromus inermis*).

Seed of this grass was sown on the Hay irrigation area only, and has germinated well. It is making a fair start, but it is too soon yet to report favourably or otherwise upon it.

Cocksfoot (*Dactylis glomerata*).

Cocksfoot seed was sown in a mixture of grasses, but at present it is difficult to say if any has germinated.

Sudan Grass (*Andropogon sorghum*).

Sufficient seed of this grass for a quarter of an acre was all that was obtainable, and this was sown at Hay. The germination has been fairly good, and the growth very prolific. Sown during the last week of August, and with three waterings at four to six weeks intervals, the plants were 3 to 3½ feet high by the end of November. It resembles Johnson grass in appearance, but not in habit of growth. It is an annual, and requires re-seeding each year, unlike Johnson grass, which retains its vitality from year to year, and spreads underground. It is hardy, and withstands the interval between waterings very well.

Panic Grasses (*Panicum flavidum* and *Panicum bulbosum*).

A few roots were transplanted at Hay, and are making very satisfactory growth. They are hardy grasses, and possess fine stems and soft flag. They are summer growers, and perennial in habit.

A Suspected Plant.

There is a sweet-scented climber common in the western districts which covers small shrubs and trees with its foliage. It has yellowish flowers and long fruits of medium length, with an abundance of silky hairs to the seeds. Its botanical name is *Lyonsia eucalyptifolia.* It climbs trees, forming dense masses, in some cases rising to 60 feet.

Opinions as to its value to the pastoralist vary. Some consider it simply as a useful fodder plant, while others are inclined to look upon it with suspicion. For example, a correspondent of Mr. Peacock, then in charge of the Experiment Farm at Coolabah, wrote to the *Agricultural Gazette*, New South Wales, 1899, p. 882, stating that it is an excellent fodder plant, but that it may make the sheep quite stupid.

Quite recently a Girilambone pastoralist, in falling scrub for his sheep, cut down a tree on which the creeper was growing. Some of the sheep ate it, and next morning he found seven of them dead within a radius of a hundred yards.

Of course it may be that a plant will destroy sheep without being actually poisonous, as animals may not eat large quantities of succulent food without safeguards, but it seems to form a matter for inquiry, and, as an excellent photograph is submitted in regard to the plant in question, it is to be hoped that further attention will be drawn to this particular plant.—J. H. Maiden.

Panicum globoideum Domin.

AN AUSTRALIAN GRASS WHICH HAS BEEN CONFUSED WITH *P. flavidum* RETZ.

J. H. MAIDEN and E. CHEEL.

Panicum globoideum Domin is described in Fedde's Repertorium Specierum Novarum, x, 119 (1911) in Latin, of which the following is a free translation :—

Allied to *P. flavidum*. Stems very robust below, slender above, usually erect with a more or less leafy panicle, reaching a height of about 4 dm. Leaves and leaf-sheaths glabrous, smooth, the latter somewhat dilated below, glaucous, striate, and with spreading pale glaucous leaves which are usually glabrous, ligule short-ciliate. Panicle 10–15 dm. long with short, somewhat distant, branches of spikelets below, the upper branches often reduced to a single spikelet, which are usually indistinctly distichous.

Upper branches simple, the rachis sometimes ending in a distinct aristate point. Spikelets distinctly but shortly pedicellate, very much swollen, almost globose, shortly acute, about 4½ mm. long.

Glumes somewhat stiff, the 1st very concave, clasping, very broad, shortly pointed, seven-nerved : 2nd, very broad, semi-globose, concave, for the most part thirteen-nerved, the nerves prominent ; 3rd glume similar to the 2nd, but nine-nerved and double-keeled at the back, with a shortly mucronate or acuminate palea ; 4th glume smooth, with obsolete nerves, shortly apiculate.

This species has hitherto been included in and confused with *P. flavidum* by Bentham and others, but is quite a distinct species, as pointed out by Domin, as *P. flavidum* has a "different panicle, with two dense rows of sessile spikelets, usually very oblique and smaller, with thinner and less-nerved glumes."

The two Queensland localities given by Domin are identical with those quoted by Bentham for *P. flavidum*.

The species may be contrasted :—

1. Spikelets in two close regular rows, almost sessile, outer glume obtuse, suborbicular, three-nerved ... *P. flavidum*.
2. Spikelets not in regular rows, outer glume truncate, mostly five-nerved ... ... *P. globoideum*.

(*P. flavidum* has been figured in this *Gazette*, Vol. IV, p. 149.)

Habitat.

Queensland.—Domin records it from Springsure (coll. Wuth) and Peak Downs (coll. Burkitt), both Western Queensland localities. It is also in the National Herbarium, Sydney, from Mt. Abundance Station, Roma.

New South Wales.—We also have it from Murray Downs, Cryon (G. Clark), Gravesend (E. Breakwell, March, 1913), Moree, "forming a dense growth where water lies" (W. M. Carne, May, 1914).

All these localities are in the north-west of New South Wales, and many more additional localities require to be recorded.

Economic Value.

As *P. globoideum* has been so much confused with *P. flavidum*, it is not safe to quote notes as to fodder value published under the latter name. But, judging by analogy, it is a very valuable grass, and its abundant and large grain must be very nutritious to grazing animals. It is at least as valuable as *P. flavidum*.

Explanation of Plate.

1. Portion of plant, showing inflorescence slightly reduced.
2. Portion of leaf-sheath and leaf-blade, showing minutely bearded ligule.
3. Portion of rachis, showing three shortly pedicellate spikelets.
4. Spikelet opened out, showing—(a) outer five-nerved glume, (b) 2nd empty glume, (c) 3rd glume with (d) large palea, and (e) fruiting glume enclosing grain and (f) palea.
5. Third glume, showing palea or neuter flower.
6. Palea taken out of 3rd glume, showing abortive stamens.
7. Grain, showing ovate hilum.

Cultivated *v.* Neglected Surface in the Orchards.

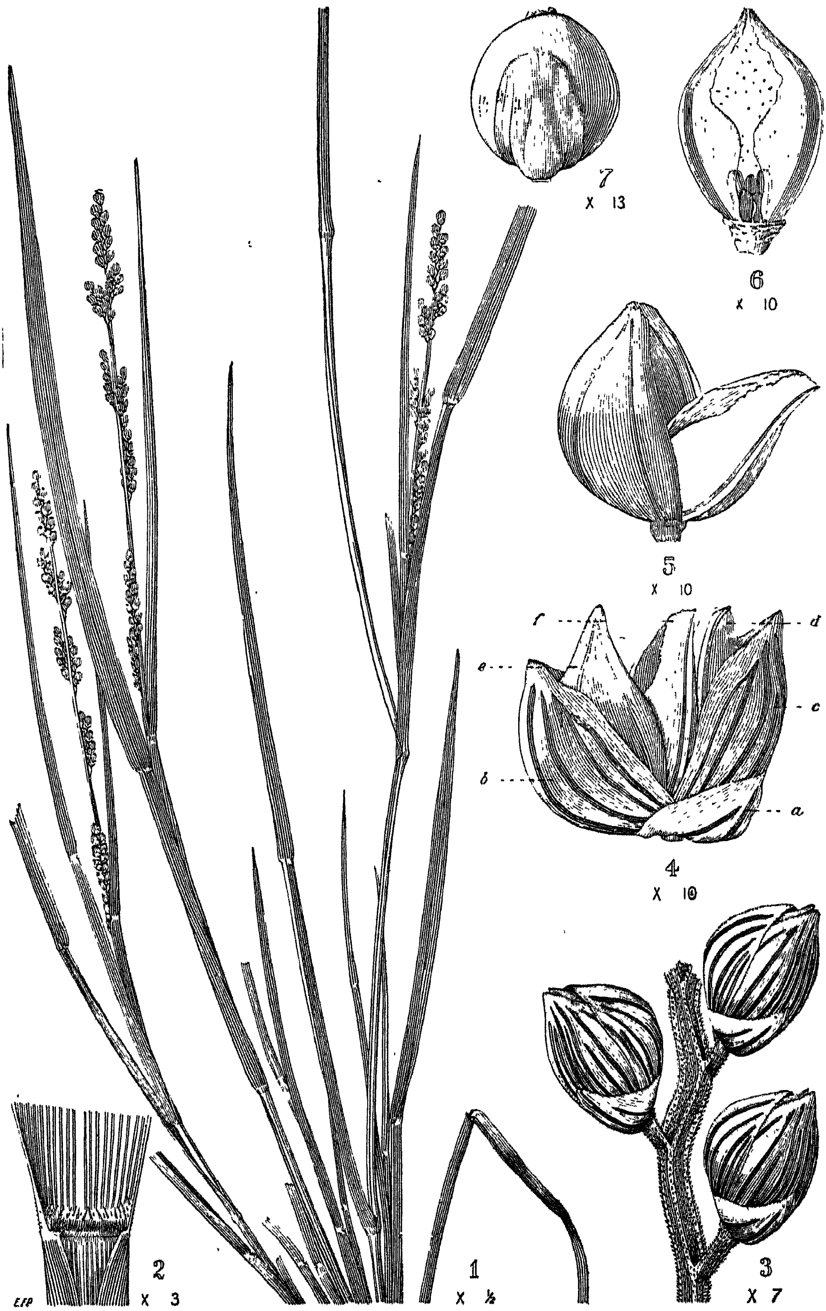
Bulletin No. 383 of the New York Agricultural Experiment Station reports the results of an extended comparison of the effects of tillage in an apple orchard in that State as against "sod mulch" or absence of tillage. An orchard of 9½ acres, chosen because the soil and topography were as far as possible uniform, was divided into two parts—one part being ploughed each spring, and cultivated from four to seven times, and the other only treated by the removal of the grass once, sometimes twice, per season. At the end of five years the orchard was divided in quarters by a line running at right angles to the first, and the treatment of the soil in the four plots continued, so that now one-quarter of the orchard has been tilled ten years; another tilled five years, and then left in sod five years; the third quarter has been in sod ten years; and the fourth in sod five years, and then tilled five years.

The average yield on the portion in sod for ten years was 69·16 barrels per acre; that on the plot tilled ten years, 116·8 barrels. The average cost per acre of growing and harvesting apples on the sod portions was 51·73 dollars; under tillage, 83·48 dollars; but while the balance per acre was 74·31 dollars in the case of the sod plots, it was 140·67 dollars, or nearly double, in the case of the tilled plots.

The fruit from the sod mulch plot was more highly coloured, and matured one to three weeks earlier, but that from the tilled plots kept two to four weeks longer, and was of better quality, being crisper, juicier, and of better flavour.

During the ten years the average gain in diameter of the trunks of the trees in sod was 2·39 inches, and of the trees under tillage 3·90 inches. The trees in sod lacked uniformity in every organ and function of which note could be taken, while the uniformity of the tilled trees was in all particulars in striking contrast.

The effect of the change from sod to tillage was almost instantaneous, tree and foliage being favourably affected before midsummer of the first year; and conversely, the effect of the change from tillage to sod was quite as remarkable and immediate, the average yield being less than half that of any one of the other three quarters.



Panicum globoideum **Domin. An Australian grass that has been confused with** *P. flavidum* **Retz.**

Insect Pests of the Strawberry.

W. W. FROGGATT, F.L.S., Government Entomologist.

THE cultivation of strawberries in the coastal districts of New South Wales is a very profitable industry, so that any pests that damage the plants or their fruit are worthy of careful observation in all stages of their development.

In Europe and North America, where large quantities of strawberries are grown, there are a number of insect pests which infest these plants, and which, though not found in Australia, could be easily introduced. Among these the following might be noticed:—

The Flower Weevil (*Anthonomus signatus*) belongs to the same genus as the destructive cotton-boll weevil of the Southern States. It is a small black beetle clothed with greyish pubescence, and lays its eggs in the undeveloped flower buds of the strawberry plant, in which the larvæ hatch out, developing with the growth of the flower buds, devouring the pollen and causing them to wither and drop off without forming fruit.

The Strawberry Root Weevil (*Otiorhynchus ovatus*) is considered one of the worst pests in Canada, and in British Columbia does so much damage that last year (1914) a bulletin, written by Mr. R. C. Treherne, was issued by the Department of Agriculture at Ottawa giving a full account of its ravages. In this case the weevil does not live in the plant, but in the soil round the roots; the legless, short, thickset, white grubs nibble at the rootlets, nipping them clean off or simply gnawing off the surface. During the damp winter months the plants may not show any signs of their presence, but as soon as the summer sets in the injured plants die out from lack of roots. The strawberry growers consider this a very difficult pest to deal with in the larval state, feeding hidden underground, but the officers of the Department of Agriculture, finding that the beetles, when they emerge, are nocturnal in their habits—feeding at night, and seeking shelter during the day—scattered pieces of board, 8 inches wide and a foot in length, all through the strawberry beds, which the beetles found were good hiding places. These simple traps were visited at regular intervals, and large numbers of beetles collected and destroyed.

The Crown Weevil (*Præpodius amabilis*) is a larger weevil, common in North America, that lays its eggs on the crown of the strawberry plant; the resultant larva, a small white grub, gnaws its way down into the solid tissue between the foliage and small roots, where it feeds and remains until full grown, pupating in the centre of the damaged tissue. The best and only successful method of dealing with this pest is to dig out and destroy all the infested plants when the beetles are in the larval or pupal stage of development.

Another small weevil (*Tyloderma fragariæ*), with very similar habits to that of the last, is often a great pest in the United States, and is checked in the same manner by being destroyed in the larval state.

A common disease in some parts of North America is known among the growers as "Buttoning" or "Strawberry Blight"; this is caused by a small black thrips (*Thrips tritici*) swarming over and puncturing the flowers.

The foliage of strawberry plants is often attacked by the larvæ of one of the Sawflies (*Emphytus maculatus*), which swarm over the plants and, like lepidopterous caterpillars, strip the leaves and weave the remaining foliage and flowers together in a tangled mass of silken web. Spraying with arsenate of lead will soon kill these leaf-eating larvæ.

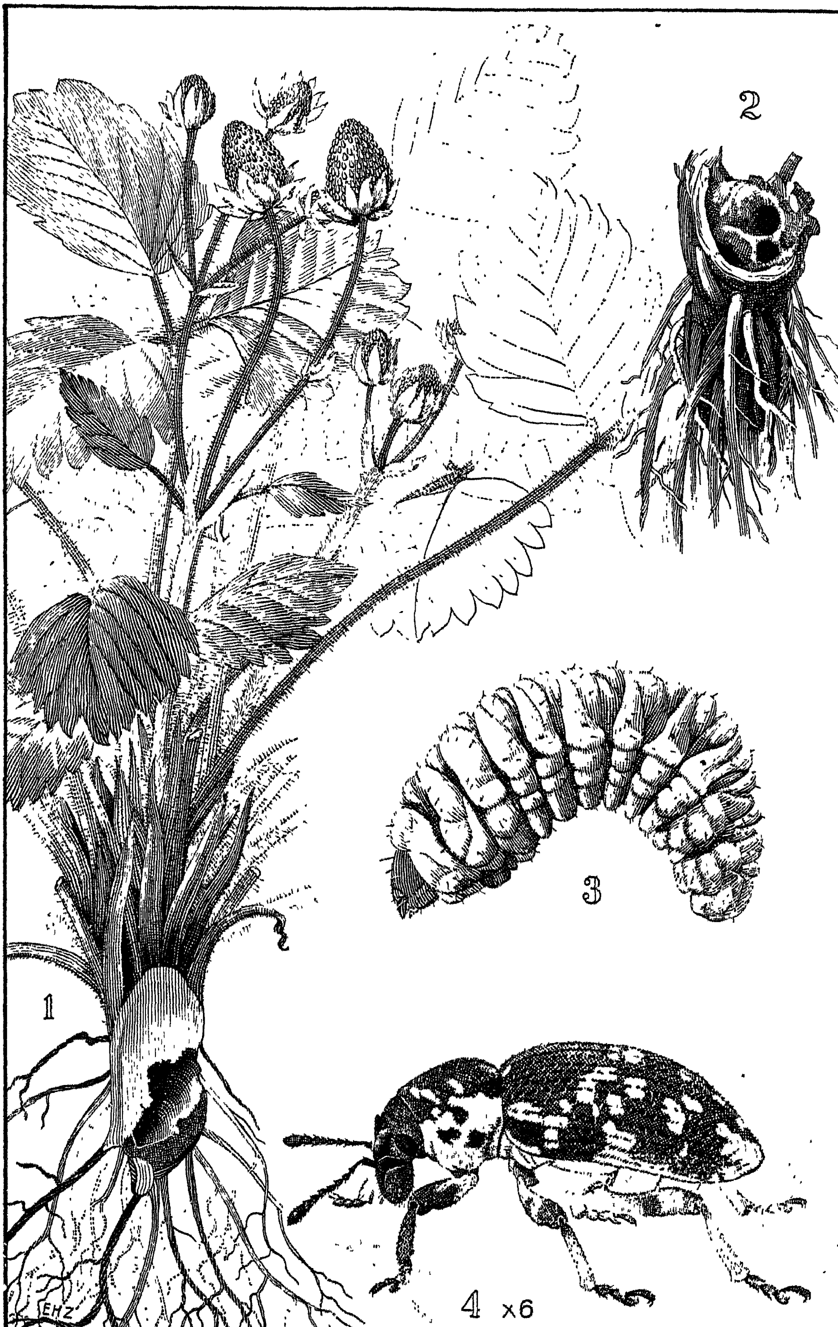
The Strawberry Weevil (*Rhinaria perdix*).

This pretty little weevil was described by Pascoe, from specimens sent to England for identification from Victoria, in the annals of Natural History in 1873.

Both in Tasmania and Victoria it had been known to strawberry growers for many years before it was scientifically described and named, but as far as the writer knows this is the first record of this beetle in strawberry gardens in New South Wales.

In 1893 French described and figured this beetle in the second part of his "Handbook of the Destructive Insects of Victoria" as a strawberry pest at that date. Mr. C. French, Junr., informs me at the present time it is almost unknown as a pest in Victoria. In Lea's "Bulletin on Insect and Fungus Diseases in Tasmania" the life history and description of this beetle is given, but the writer has been informed that it is not a very serious pest in Tasmania.

Last October specimens of diseased strawberry plants were forwarded from a garden near Bungendore containing pupæ and live beetles that were just emerging from the damaged plants, which, on examination, proved to be this handsome little weevil. In the second week in November the writer paid a visit to Bungendore and made a careful examination of the infested strawberry plants, but by this time all the beetles had emerged from the damaged plants, and we only obtained two specimens of belated beetles upon the foliage. It is therefore evident that the beetles are fully developed and leave their winter quarters, in the crown of the plant, from the end of August to the early part of November, and it will be during that time that the beetles will infest the fresh strawberry plants by depositing their eggs upon the crown of the plants. Therefore, what infestation of the existing strawberry plants is going to take place will have taken place before the end of the year, probably by the end of November this year. If in an infested area all the plants are dug up and burnt (though a drastic method), it would mean very slight danger of infestation the next season in freshly-planted beds.



1.—Strawberry plant showing damage caused to roots by the larva of the Strawberry Weevil.
2.—Broken crown above roots on infested plants.
3.—Larva of Strawberry Weevil.

Life History.

The egg or eggs (for we sometimes find two grubs in the crown of one plant) are deposited by the beetles on the surface of the central part of the plant; the larvæ, hatching out very soon after, bore into the tissue and take up their quarters in the hard woody tissue below the foliage and above the fine roots. Here they remain feeding and growing until they are fully fed, when they pupate in the cavity caused by the feeding of the active larva, and from there the beetle emerges in the spring. The larva is a typical short, rather thick-set weevil grub, without legs, and furnished with a small brown head. The perfect beetle is about one-third of an inch in length, with a short snout, above which, and between the circular black eyes, are two curious flattened-down horn-like processes. The thorax is short, broad and rounded on the sides and constricted behind. The abdomen is short in proportion, broad but rounded on the sides in front, with the stout deeply striated, punctured wing covers coming to a blunt point at the extremities, covering the well-developed hind wings folded beneath.

The ground colour of the whole beetle is dark brown, but it is so thickly covered with patches of minute chocolate-brown and creamy-white scales that it has a richly variegated coat of reddish-brown and white. These scales are thickest on the under surface, legs, and the sides of the head, thorax, and stripe down the edge of the wing covers, with an irregular variegated pattern on the dorsal surface. The beetles are active little creatures, running about over the foliage, but when disturbed hiding on the under side of the leaf or dropping to the ground. They are furnished with a pair of well-developed wings, and can fly well, so that they could easily travel considerable distances from their breeding grounds. From our observations it appears that the life cycle of this beetle is completed in the year, the eggs being laid in October and the beetles appearing in the following October.

Clean cultivation and the destruction of all infested or doubtful plants either before the beetles emerge or after the beetles have finished their early summer infestation appears to be the best method of treating this pest. Trapping them with bits of board interspersed among the plants might also be tried with good results.

The Shining Cockchafer (*Anoplognathus analis*).

In the early part of 1901 the writer published in the *Agricultural Gazette* an account of the damage caused by the infestation of some strawberry beds at Castle Hill, New South Wales. These beetles and several other species of the genus are popularly known as "Cockchafers," though not identical with the true English cockchafer. In the adult state they feed upon the foliage of the different species of gum trees (*Eucalyptus*), and sometimes swarm on the foliage of the introduced pepper tree (*Schinus molle*) grown so largely as a shade tree in all parts of Australia. They are large-sized oval beetles of a general biscuit-brown tint, often with rich metallic tints.

The larvæ—thick-set, wrinkled, white grubs that usually hold the body in a rounded or curved-in position—are furnished with a horny head, stout black jaws, and three pairs of slender brown or reddish legs. The beetles lay their eggs in vegetable mould or earth thickly impregnated with humus, upon which the grubs feed until full-grown, when they pupate enclosed in a thin papery membrane in a cavity in the ground.

In their natural state they also feed upon the roots of grass and herbage, and as strawberries are usually planted in rich soil (such as often contains the grubs of the cockchafer beetles) the roots of the introduced crops are found and devoured.

Last month a lady growing strawberries on the Blue Mountains sent in specimens of the larvæ of our Shining Cockchafer, with the statement that there were numbers of them in the loose soil about her strawberry plants, where they were damaging the roots in exactly the same way as they had done at Castle Hill. In England the strawberry growers suffer considerable loss from the white grubs of their common cockchafer, which devour the roots in a similar manner.

Suggestions and Remedies.

Where the soil is loose and friable and these white grubs are at work, it is possible to dig out a large number with a small hand fork without seriously disturbing the infested plants. Those raked out with a fine-pronged fork can be easily collected and destroyed.

The application of such dressings as kainit or nitrate of soda, which not only damage the larvæ and pupæ when they come in contact with them, but promote the growth of rootlets to renew those injured by the beetle grubs, is recommended.

Carabid Beetles.

A number of the nocturnal carnivorous beetles that come for shelter among the strawberry plants and the mulching around them, have been found to feed upon the ripe strawberries, and, when numerous, often do a great deal of damage.

In Great Britain, Theobald says that the most destructive and numerous is *Harpalus ruficornis*. The beetles attack the berries at night, usually just when the fruit is ripening. In New South Wales we have several records of carabs attacking ripe strawberries, and one of the large *Clivina*, which usually frequent damp situations, is very common in strawberry beds.

Where they are numerous and doing any serious damage it will pay to trap them by sinking clean condensed milk or jam tins with the open top level with the surface of the surrounding soil, into which the beetles tumble when hunting at night, and are unable to climb up and escape.

Damage by Plant Bugs.

There are at least four species of *Hemiptera* that are common in our coastal districts, and find shelter and food in the strawberry beds, where they either feed upon the ripe fruit or give it a very objectionable taint by resting upon it.

The Harlequin Fruit Bug (*Dindymus versicolor*) is very partial to all kinds of soft fruit, and, among many others, is fond of ripe strawberries. It is an active bright red and black bug, about half-an-inch in length, common on many plants in October and November.

The Brown Ground Bug (*Dictyotus plebejus*), often found in paddocks under fallen logs, stones, or dry cow-dung, crawls about among the foliage and comes on the fruit, to which it imparts a very objectionable taint.

The Rutherglen Bug (*Nysius vinitor*), which is one of our worst insect pests upon all field crops and ripe fruit, has not been often recorded as a strawberry pest, but on account of the enormous numbers that appear in the early summer it is one of the enemies that should be looked for at all times.

The Coon Bug (*Oxycarenus lectularis*), a closely allied species to the last, has very similar habits, and in the West often appears in countless millions. In the early stages of growth they are bright red, but in the final moult the black and white wing covers hide the red body of the immature forms, and they look quite a different insect. This season we have had specimens of this small bug sent in from Goshen, near Oberon, with the information that they were swarming over the plants and damaging the strawberries in that district.

Clean cultivation, with the clearing up of all the weeds and herbage that are so often allowed to grow up in a luxuriant mass along the fences, is a great help in keeping plant bugs away. In a large garden the writer has often noticed that when the strawberry beds were in the centre of the ground, away from the fences and grass paddocks beyond, they were very much less subject to infestation than those on the boundary of the garden.

Smoke will often drive plant bugs away if it can be driven over the plants, but no spraying seems to be effective that would not at the same time damage the fruit.

Milking Machines in Victoria.

As the result of extensive experiments carried on at the Lady Talbot Institute in Victoria, Mr. R. T. Archer, Senior Dairy Inspector, states that the investigations have demonstrated the following points :—

1. That, provided the apparatus of the milking machine is intelligently handled, and that it is thoroughly attended to as regards cleanliness and sterilization, its use does not interfere with the general health of the cow or of the udder.
2. That the milking machine so used does not lead to a greater bacterial contamination of the milk than does the process of hand milking, even when conducted under the most approved conditions; but that, on the contrary, the average results show an improvement.

The Quality of Farm Seeds sold in New South Wales.

W. M. CARNE, Botanic Gardens.

DURING the past year 104 samples of farm seeds were obtained for examination from Sydney seedsmen and country storekeepers. The samples were obtained by purchase in the ordinary way or taken from the stock exposed for sale, and may be considered, as far as they go, typical samples of the seed sold in this State. The results of the tests are given in this note.

Evidence of impurity of variety was detected in many samples of maize. In fact, purity in maize is rather rare. Also noted in vetches and cowpeas.

In general the purity of the samples was fairly good. As might be expected the excessive presence of weed seeds was mainly confined to grasses, clovers, and lucerne. A few cases may be quoted to emphasise the dangers of impure seed. Sowing the rye grass, according to Sample No. 32, at the rate of 40 lb. per acre, would mean sowing 800,000 weed seeds to the acre. Lucerne (Sample No. 38) sown at the rate of 12 lb. would mean 30,000 weed seeds to the acre, while 10 lb. of paspalum (Sample No. 46) sown with 2 lb. white clover (Sample No. 76) would result in 115,000 weed seeds being distributed over 1 acre. It is obvious that such seeds are dear at any price.

With the exception of nine samples of seeds of varieties for which standards have not yet been adopted, 60 per cent. of the samples were found to be under standard. The standards adopted are based upon European and American experience as to what would be expected from good—though not the best—seed, though somewhat modified to meet local experience. It must be remembered that the results obtained in germination tests are higher than those obtained under the usual conditions of sowing. Further, it should be noted that low germination results are usually accompanied by lack of vigour in the seedlings which do grow. The difference between two samples of high and low germination is greater than is indicated by the test results.

The following samples were found to be worthless for seeding:—

No germination.—Paspalum (Sample No. 47); Hungarian Brome grass (No. 15); Prairie grass (No. 16); Japanese clover (No. 30).

Very poor germination.—Rape (No. 12); turnip (No. 14); Rhodes grass (No. 19); pumpkins (Nos. 21 and 22); lucerne (No. 35); Canary grass (No. 49); Canadian Wonder beans (No. 52); Yorkshire Hero peas (Nos. 66 and 69); sorghum (Nos. 70, 73, 75).

Ergots (sclerotia) were found in Hungarian Brome grass (No. 15) and Perennial Rye grass (Nos. 32 and 33). In the absence of direct evidence of ergotised grass causing ergotism in cattle in this State it is not advisable to sow seed containing this fungus.

Sorghum smut was found in a locally-grown sample on sale in Tamworth This disease has not previously been reported for this State.

Moulds due to harvesting unripe seed and the consequent sweating were most noticeable in sorghum and cowpeas.

The following insects injurious to seeds were found:—

Lucerne seed wasp in lucerne (two samples).

Pea weevil in field peas (one sample).

Common or rice weevil in maize, sorghum, and Skinless barley (twelve samples).

Of ten samples of maize from the North Coast nine were affected by weevils. The germination of weevily seed was tested separately from the sound seed. From 2 to 20 per cent. of the seeds were affected, and the resultant loss of germination varied from 1 to 8 per cent., or an average of 3 per cent. in all.

IMPURITIES DETECTED IN SEED SAMPLES.

Latin Name.	Common Name.	No. of Samples.
Plantago lanceolata	Rib grass	10
**Rumex acetosella*	Sheep's sorrel	10
Brassica spp.	Mustards	7
Medicago lupulina	Black medick	7
Paspalum dilatatum	....	6
**Avena fatua*	Black oats	5
Bromus racemosus	....	5
**Rumex* spp.	Docks	5
**Hypœcœris* spp.	Cats-ears	4
Panicum miliaceum	Millet	4
**Stellaria* spp.	Chickweed	4
Boerhaavia diffusa	Tarvine	3
Festuca bromoides	Rat-tail grass	3
Polygonum spp.	Smartweeds	3
Phleum pratense	Timothy grass	3
**Silene* spp.	Catchfly	3
Trifolium hybridum	Alsike clover	3
**Amaranthus* spp.	Pigweeds	2
Atriplex semibaccata	Creeping saltbush	2
Chenopodium spp.	Fathen	2
Chloris gayana	Rhodes grass	2
Geranium molle	Cranesbill	2
Lolium perenne	Perennial rye grass	2
Lolium temulentum	Darnel	2
Panicum sanguinale	Summer grass	2
**Polygonum aviculare*	Wire or knot weed	2
Phalaris spp.	Canary grass	2
Prunella vulgaris	Selfheal	2
Setaria viridis	Pigeon grass	2
Trifolium dubium	Suckling clover	2
Vicia angustifolia	Wild vetch	2
**Brassica sinapistrum*	Charlock	1
**Cerastium vulgatum*	Chickweed	1
Holcus lanatus	Yorkshire fog	1
**Lepidium campestre*	Field cress	1
**Lithospermum arvense*	Corn gromwell	1
Linum marginale	Wild flax	1
Lolium multiflorum	Italian rye grass	1
Medicago denticulata	Trefoil or burr clover	1
Panicum crusgalli	Ditch millet	1
**Picris echioides*	Ox tongue	1
**Spergula arvensis*	Spurrey	1
Sherardia arvensis	Field madder	1
Salvia verbenacea	Wild sage	1
Sorghum halepense	Johnson grass	1
Trifolium pratense	Red clover	1

Those marked * are weeds prohibited from importation into the Commonwealth under the Federal Quarantine Act, 1908.

RESULTS OF TESTS OF FARM SEEDS ON SALE IN NEW SOUTH WALES, 1914.

No.	Latin Name.	Common Name.	Standard Purity.	Pure Seed.	Inert Matter.	Weed Seeds.	Standard Germination.	Germination.	Approximate number of Weed Seeds in 1lb. of sample.
			per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	
1	*Atriplex halimoides*	Saltbush	......	100	......	......	......	14	......
2	" *semibaccata*	"	......	90	10	......	......	52	......
3	" *vesicaria*	"	......	100	......	......	......	18	......
4	*Avena sativa*	Oats	99	99·75	·02	·23	95	79	108
5	" "	"	......	93	·5	6·5	......	97	1,995
6	" "	"	......	99	·25	·75	......	95	299
7	" "	"	......	99	·5	·5	......	98	453
8	" "	"	......	98·6	·4	1	......	97	217
9	" "	"	......	99·5	·5	......	......	95	15
10	*Brassica napus*	Rape	100	100	......	......	95	93	......
11	" "	"	......	100	......	......	......	99	......
12	" "	"	......	99·4	·1	·5	......	56	724
13	" *ruabaga*	Swede turnip	100	99	·5	·5	95	75	195
14	" *rapa*	Turnip	100	98	2	......	95	27	......
15	*Bromus inermis*	Hungarian Brome grass	95	97	2	1	75	......	105
16	" *unioloides*	Prairie grass	98	99	·75	·25	80	......	270
17	*Chloris gayana*	Rhodes grass	95	92	7·5	·5	25	47	907
18	" "	" "	......	95	5	......	......	13	......
19	" "	" "	......	100	......	......	......	5	......
20	" "	" "	......	100	......	......	......	16	......
21	*Cucurbita pepo*	Pumpkin	100	100	......	......	90	44	......
22	" "	"	......	100	......	......	......	52	......
23	" "	"	......	100	......	......	......	84	......
24	*Dactylis glomerata*	Cocksfoot	95	99·9	......	·1	70	43	440
25	*Danthonia pilosa*	Wallaby grass	......	100	......	......	......	51	......
26	*Eragrostis abyssinica*	Teff grass	......	99·9	......	·1	......	92	2,720
27	*Fagopyrum esculentum*	Buckwheat	100	99·7	·1	·2	90	94	196
28	*Hordeum sativum*	Skinless barley	100	99·5	·25	·25	95	90	51
29	" "	Cape barley	......	99·5	·5	......	95	97	......
30	*Lespedeza striata*	Japanese clover	......	100	......	......	......	......	......
31	" "	" "	......	56	19	25	......	36	154,000
32	*Lolium perenne*	Perennial rye grass	95	93·2	·8	6	75	79	19,710
33	" "	" "	......	98	......	2	......	56	3,990
34	*Lolium multiflorum*	Italian rye grass	95	95	......	5	75	43	13.452
35	*Medicago sativa*	Lucerne	98	99·25	·5	·25	85	54	1,132

RESULTS OF TESTS OF FARM SEEDS ON SALE IN NEW SOUTH WALES, 1914—*continued.*

No.	Latin Name.	Common Name.	Standard Purity.	Pure Seed.	Inert Matter.	Weed Seeds.	Standard Germination.	Germination.	Approximate number of Weed Seeds in 1 lb. of Sample
			per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	
36	*Medicago sativa*	Lucerne	98	98·7	·3	1	85	76	906
37	„ „	„	......	99·3	·2	·5	......	78	1,589
38	„ „	„	......	99	......	1	......	72	2,567
39	„ „	„	......	97·4	1·6	1	......	74	2,290
40	„ „	„	......	96·5	3·5	......	......	93	363
41	„ „	„	......	99·6	·2	·2	......	75	453
42	„ *lupulina*	Black medick	......	98·6	·4	1	......	48	1,582
43	*Melilotus alba*	Bokhara clover	......	99	·5	·5	......	59	680
44	*Panicum colonum*...	Japanese Millet	95	89	11·0	......	90	90	......
45	*Paspalum dilatatum*	....	95	96·7	3·0	·3	25	49	302
46	„ „	....	......	96	1·0	3	......	37	5,500
47	„ „	....	......	100	......	......	......	......	......
48	*Panicum miliaceum*	French millet	95	94·4	·6	5	90	72	680
49	*Phalaris bulbosa*	Canary grass	95	98	1	1	80	28	5,653
50	*Phaseolus vulgaris*...	Beans, Canadian Wonder ...	100	100	......	......	95	96	......
51	„ „	„ „	......	100	......	......	......	98	......
52	„ „	„ „	......	100	......	......	......	60	......
53	„ „	„ „	......	100	......	......	......	96	......
54	„ „	„ „	......	100	......	......	......	90	......
55	„ „	„ „	......	100	......	......	......	100	......
56	„ „	„ Stringless	......	100	......	......	......	80	......
57	*Pisum arvense*	Field Peas	100	100	......	......	99	99	......
58	„ „	„	......	100	......	......	......	100	......
59	„ „	„	......	98·9	·4	·7	......	99	108
60	„ „	„	......	100	......	......	......	98	......
61	„ „	„	......	98·7	·1	1·2	......	100	57
62	„ *sativum*	Peas, Yorkshire Hero	100	100	......	......	95	88	......
63	„ „	„ „	......	100	......	......	......	92	......
64	„ „	„ „	......	100	......	......	......	96	......
65	„ „	„ „	......	100	......	......	......	92	......
66	„ „	„ „	......	100	......	......	......	74	......
67	„ „	„ „	......	100	......	......	......	84	......
68	„ „	„ „	......	100	......	......	......	88	......
69	„ „	„ „	......	100	......	......	......	72	......
70	*Sorghum vulgare*	Planters' Friend	100	99	1	......	80	40	......

RESULTS OF TESTS OF FARM SEEDS ON SALE IN NEW SOUTH WALES, 1914—*continued.*

No.	Latin Name.	Common Name.	Standard Purity.	Pure Seed.	Inert Matter.	Weed Seeds.	Standard Germination.	Germination.	Approximate number of Weed Seeds in 1 lb. of Sample.
			per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	
71	*Sorghum vulgare* ...	Planters' Friend ...	10	100	......	......	80	90	......
72	,, ,,	,, ,,	......	100	......	......	......	81	......
73	,, ,,	Early Amber Cane	......	99	1	......	......	64	......
74	,, ,,	,, ,,	......	100	......	......	......	73	......
75	,, ,,	Imphee ...	......	100	......	......	......	67	......
76	,, ,,	,,	......	99·5	·5	......	......	75	......
77	,, ,,	Broom millet	......	99·5	·5	......	......	80	......
78	,, ,,	,, ,,	......	98	2	......	......	86	......
79	*Trifolium hybridum*	Alsike clover	96	97·5	·5	2	85	83	11,568
80	,, *pratense*	Red clover	98	99·9	......	·1	90	90	91
81	,, ,,	,, ,,	......	94·4	2·6	3	......	77	12,518
82	,, *repens*	White clover	95	95	......	5	80	79	27,658
83	,, ,,	,, ,,	......	97·5	......	2·5	......	90	13,393
84	,, ,,	,, ,,	......	91	·5	8·5	......	77	30,838
85	*Vicia faba* ...	Broad bean	100	100	......	......	95	90	......
86	,, ,, ...	,, ,,	......	100	......	......	......	100	......
87	*Vicia sativa*	Vetch ...	100	99·2	·2	·6	95	100	40
88	,, ,,	,,	......	100	......	......	......	98	......
89	,, ,,	,,	......	75·5	......	24·5	......	100	1,500
90	*Vigna catjang*	Cowpea ...	100	99	1	......	90	94	......
91	,, ,,	,,	......	97	3	......	......	86	......
92	,, ,,	,,	......	100	......	......	......	96	......
93	*Zea mays* ...	Maize, Hickory King ...	100	100	......	......	95	86	......
94	,, ,,	,, Iowa Silvermine	......	100	......	......	......	80	......
95	,, ,,	,, Clarence Champion	......	100	......	......	......	90	......
96	,, ,,	,, Red Hogan ...	......	100	......	......	......	76	......
97	,, ,,	,, ,, ,,	......	100	......	......	......	96	......
98	,, ,,	,, Early Dent ...	......	100	......	......	......	88	......
99	,, ,,	,, Yellow Dent ...	......	100	......	......	......	82	......
100	,, ,,	,, ,, ,,	......	100	......	......	......	96	......
101	,, ,,	,, Leaming ...	......	100	......	......	......	92	......
102	,, ,,	,, ,,	......	100	......	......	......	87	......
103	,, ,,	,, Clarence Wonder	......	100	......	......	......	91	......
104	,, ,,	,, Golden Beauty ...	......	100	......	......	......	90	......

Importation of Clydesdale Mares.

S. T. D. SYMONS, Chief Inspector of Stock.

For some considerable time it has been recognised that the horse stock of New South Wales of the Clydesdale breed is inferior to that bred in the neighbouring State of Victoria and in New Zealand.

The importations of pure-bred Clydesdales from Scotland have been few and far between for a number of years, breeders showing a somewhat spasmodic interest in developing and improving the breed on the right lines. The visit of the Scottish Commission, and the somewhat pointed remarks of several of the Commissioners on the stock bred on the Government Farms, led to action being taken by the Government, with the view of improving the breeding of draught horses on the farms, and as a result the late Mr. Treflé, then Minister of Agriculture, arranged for the importation of three Clydesdale stallions, and three mares of the same breed, in the latter part of 1912.

The advent of these horses, and the interest their presence stimulated, led to a special consideration of the breeding of horses on Government Farms, and Mr. Valder, Under Secretary, directed the Stock Branch, Department of Agriculture, to furnish a report on the whole question. Mr Sanderson, M.R.C.V.S., one of the Veterinary Officers of the Branch, was entrusted with the work, and after visiting all the farms a comprehensive report was furnished. The Under Secretary was quick to recognise that the purchase of a number of pure-bred Clydesdale mares, as recommended in the report, was essential to any rapid improvement of our stock, and that the effect of an importation of pure-bred stock would not only be felt on the Government farms, but would also be of great assistance to other Clydesdale breeders.

The matter being laid before the Minister of Agriculture (the Hon. W. G. Ashford, M.L.A.), he approved of the importation of a number of mares, and had a sum of money placed on the estimates for the purpose. Mr. Sanderson was entrusted with the mission of proceeding to Scotland to make the selection of mares suitable for the formation of a Clydesdale stud.

Seventeen mares, representative of a number of the best strains of blood in Scotland, were selected by Mr. Sanderson, and were shipped per s.s. "Dorset," arriving in Sydney on 27th December, 1914. After the usual period in quarantine, they were transferred to Hawkesbury Agricultural College, where they soon began to recover from the effects of the voyage. An opportunity of inspecting the animals at the College was afforded a number of farmers and breeders on the 14th January, the universal opinion being that several of the lot were very fine mares indeed, and that all of them would be distinctly useful in raising the standard of the Clydesdales of New South Wales.

It is intended to publish in the *Gazette* illustrations of some of the most notable of the group, but as time had to be afforded for full recovery from the voyage, the photographs could not be obtained in time for this issue.

The following are pedigrees and particulars of the imported mares:

WOODHALL ECLIPSE (36919).

Sire, Top Fashion (13812); 1st dam, Nancy of Woodhall (32479), by General Kuroki (13498); 2nd dam, Sis of Gibside (26300), by Brunstane Boy (10708); 3rd dam, Review (14060), by Look Again (5972); 4th dam, Bett (vol. 15, p. 130), by Robbie Burns (699); 5th dam, Bet, by Lothian Tom (1211).

Woodhall Eclipse (foaled 18th April, 1912) has not been served. She was first at Silloth Show; first at Annan; first and champion of the breed at Lockerbie, beating several noted winners.

ESMER (36909). Foaled 1911.

Sire, Apukwa (14567); 1st dam, Lady Jane (19569), by Balmedie Queen's Guard (10966); 2nd dam, Jean of Wester Frew (15218), by Royal Gartly (9844); 3rd dam, Jean, by Prince of Currah (8916); 4th dam, Darling, by Knight Errant (4483).

Since the death of Baron o'Buchlyvie, Apukwa has been considered the leading sire of Scotland. Royal Gartly is a Cawdor Cup winner.

In 1912 Esmer came through the whole list of shows unbeaten in her class. She carried first prize at the Royal Show of England; at the Highland Show; at the Spring Show of the Royal Northern at Aberdeen; at the Summer Show at Aberdeen; at Kilmarnock; at Ayr; at Glasgow Stallion Show; at Stirling Show; and at Perth Show. She is full sister to the yearling champion colt of 1914, now named Dunure Birkenwood. This colt has joined the Dunure stud at a cost of £3,000. Esmer is also full sister to the famous Nannie, the mare that carried everything before her in the hands of Mr. Stephen Mitchell, of Boquhan. No trio out of the same dam and by the same sire have had such a successful career of prize winning as have Nannie, Esmer, and Dunure Birkenwood. Esmer is stinted to the famous Baron o'Buchlyvie.

TORRS BARONESS (36916).

Sire, Baron o'Buchlyvie (11263); 1st dam, Ellen (27248), by Everlasting (11331); 2nd dam, Mabel of Torrs (13571), by Prince Romeo (8144); 3rd dam Quality of Torrs (10953), by Macgregor (1487); 4th dam, Bess of Torrs (3982), by Bonnie Scotland (1076); 5th dam, Jean (2071), by Lochfergus Champion (449).

Torrs Baroness' sire, Baron o'Buchlyvie, fetched £9,500 at public auction. At the time of his death (August, 1914) he was the leading sire in Scotland. Her dam, Ellen, by the Baron's Pride horse, Everlasting, was a well known mare, and won something like twenty first prizes for her owner. Everlasting was first three times at the Highland Show, and once champion.

Torrs Baroness (foaled 20th April, 1911), won the following prizes:—First at Perth (yearling); first at Crieff (yearling); first at Stirling (yearling); first at Dalboatie (2 years old); second at Castle Douglas (2 years old). Torrs Baroness is served by Apukwa.

MARINARILLA (36913).

Sire, Marcellus (11110); 1st dam, Favourita (21437), by Royal Favourite (10630); 2nd dam, Rosie of Mains (15587), by Royal Reign (10440); 3rd dam, Lily of Mains (12802), by Master of Lundin (8842); 4th dam, Lily of Napierston (12208), by Glinns (3655); 5th dam, Nancy, by The Tifter (871).

Marcellus, the sire of Marinarilla, is by the celebrated Hiawatha by Prince Robert by Prince of Wales. Marcellus is a Cawdor Cup and Bryden Shield winner. Royal Favourite, sire of Marinarilla's dam is one of the leading Scotch sires.

Marinarilla (foaled 21st June, 1911) won at many Fife Shows, and at Perth. She is served by Scotland's Favourite, a son of Royal Favourite, and a sire with a great and growing reputation.

LADY LAMB (36912).

Sire, Revelanta (11876); 1st dam, Lady Leith (29334), by Everlasting (11331); 2nd dam, Lady Ida (15438), by Prince Thomas (10262); 3rd dam, Lady Maud (14177), by Sir Everard (5353); 4th dam, Eveline (9504), by Garnet Cross (1662); 5th dam, Maggie of Kirkland (2472), by Warrior (902).

Lady Lamb's sire, Revelanta, is a Cawdor Cup winner, whilst her grand sire and great grand sire won championships at the Highland Agricultural Society's Shows. The next cross is the son of Top Gallant, Sir Everard, the sire of Baron's Pride; and the next Garnet Cross, a popular premium horse sold by public auction thirty years ago for £700.

Lady Lamb (foaled 11th April, 1912) was served by Signet, the noted son of Allandale. Lady Lamb was second at the Aberdeen Spring Show, 1914, besides winning many prizes as a yearling.

POLLY OF BRODIESHILL (36908).

Sire, Sir Matthew (12747); 1st dam, Queen of Brodieshill (30383), by Pride of Airies (11454); 2nd dam, Doll of Brodieshill (30382), by Fashion's Fancy (9525); 3rd dam, Jip of Brodieshill (30381), by Macnab (3824); 4th dam, Rose of Brodieshill (30380), by Leopold alias Young Lord Lyon (3766); 5th dam, Jess of Brodieshill (10998), by Royal Chief (730).

Sir Matthew, by Marmion, is the leading sire of the Northern Stud Company at Elgin. He is a sire with a great reputation, and the last Elgin Show was a triumph for his stock.

Polly (foaled 10th May, 1909) was first at Elgin as a 3-year old; second at Elgin as a 4-year old (28 in class); first at Elgin as a 5-year old; winner of Innes Challenge Cup and Medal as the best draught mare for breeding purposes; first for group prize (yearling and foal). Polly of Brodieshill was served by The Dunure, a son of Baron o'Buchlyvie, by Baron's Pride, &c.

MARGARET OF NETHERLEA (35041).

Sire, Scottish Pride (14841); 1st dam, Jess of East Holmes (30136), by Hiawatha (10067); 2nd dam, Mayflower (18821), by Royal Pride (10279); 3rd dam, Flower of Bardrainey (18820), by Prince Gallant (6176); 4th dam, Darling of Bardrainey (4686), by Prince of Renfrew (664).

Scottish Pride is by Baronson (sire of Oyama), by Baron's Pride, by Sir Everard, by Top Gallant, by Darnley. Margaret of Netherlea's dam, Jess of East Holmes, was by the celebrated Hiawatha, by Prince Robert, by Prince of Wales. Hiawatha won the Cawdor Cup on no less than four successive occasions.

Margaret of Netherlea (foaled June, 1910) won the following prizes:—As a 2-year old—First, Galston and reserve champion; first, Kilwinning and champion; second, Barrhead Open Show; first, Cathcart; first, Eastwood. Not shown as a 3-year old. As a 4-year old—Second, Paisley; second, Barrhead; second, East Killbride; first, Cathcart and reserve champion.

Margaret of Netherlea is served by Auchenflower, a noted sire that stands ninth on the list of winning sires for 1913.

COUNTESS OF LETTRE (36906).

Sire, Sir Hugo (10924); 1st dam, Rosie McAulay (28655), by Royal Chattan (11489); 2nd dam, Bessie Marshall (22527), by Royal Blantyre (10269); 3rd dam, Minnie Alexander (20610), by Prince Alexander (8899); 4th dam, Nessie (12307), by Prince of Kyle (7155); 5th dam, Nina of Portnellan (2845), by Farmer (286).

Sir Hugo is mentioned in the pedigree of Torrs Canty. Royal Chattan, sire of Countess of Lettre's dam, was a Glasgow Premium horse.

Countess of Lettre (foaled May, 1910) won the following prizes:—First at Paisley; first at Greenock; first and champion at Killearn; first and champion at Drymen. She is served by Royal Favourite, a great sire, whose foals include Harviestoun Phyllis and Scotland Yet, both Cawdor Cup winners.

VERONICA (35313).

Sire, Montrave Ronald (11121); 1st dam, Jean (27414), by Royal Baron (11161); 2nd dam, Bute (17138), by Robert Darnley (10115); 3rd dam, Maggie Lauder (13070), by Lammermoor Lad (7906); 4th dam, Rosabelle Ray (9629), by Middleton Laddie (3843); 5th dam, Kate of Coates (7241), by Glancer (3635).

Montrave Ronald, Veronica's sire, is by Montrave Mack, by Macgregor, by Darnley. Royal Baron, sire of Jean, Veronica's dam, is by Baron's Pride.

Veronica (foaled April, 1909) won the following prizes:—First and champion, Old Cumnock; fourth, Keith; first, New Cumnock; third, Huntly; first, Inverness; second, Inverness; second, Elgin; fifth, Royal Northern, Aberdeen, 1912; first and champion, at Elgin. Veronica is served by Allandale, by Sir Hugo. Allandale is the sire of Clandale, now in the possession of the Government of New South Wales.

CRAIGIE RUBIE (36907).

Sire, Oyama (13118); 1st dam, Jess of Yett (36227), by Pride of Blacon (10837); 2nd dam, Jessie of Meikle Kilmorey (13147), by Prince Gallant (6176); 3rd dam, Sally (5076), by Liberal Tom (446); 4th dam, Kate (11074), by Rob Roy (2379); 5th dam, a mare by Glancer (3635).

Oyama, the sire of Craigie Rubie, won both the Cawdor Cup and the Bryden Challenge Shield. He won the Cup as a 2-year old—a great performance. Oyama is by Baronson, by the famous Baron's Pride, and is thus descended from Darnley, through Top Gallant and Sir Everard.

Craigie Rubie (foaled 1910) was served by Walton Comet (16856), a heavy black horse, a son of Baron Gibson, by Baron's Pride. In 1913, as a 3-year old, he was third at Ayr, being beaten by The Dunure, the unbeaten 3-year old of the year, and by Dunure Peer. He belongs to the celebrated Craigie Main's stud, and is considered one of the coming horses of Scotland.

MYSTERY (32291).

Sire, King Harry (14199); 1st dam, Mymi (18273), by Lord Lothian (5998); 2nd dam, Jess of Southerfield (11051), by Challenger (1088); 3rd dam, Kate, by Star of the West (828); 4th dam, Nanny, by Dumbarton (253).

King Harry is by Silver Cup, by Baron's Pride, by Sir Everard, by Top Gallant, by Darnley. Silver Cup was three times first at the Highland Show, and twice first at Royal Show of England.

Mystery (foaled 14th April, 1909) was served by Bonnie Buchlyvie, probably the most noted son of the famous £9,500-horse, the Baron o'Buchlyvie, by Baron's Pride.

TORRS PRINCESS (36918).

Sire, Radium (13674); 1st dam, Fame of Torrs (18161), by Baron's Pride (9122); 2nd dam, Mabel of Torrs (13571), by Prince Romeo (8144); 3rd dam, Quality of Torrs (10953), by Macgregor (1487); 4th dam, Bess of Torrs (3982), by Bonnie Scotland (1076); 5th dam, Jean (2071), by Lochfergus Champion (449).

Radium, the sire of Torrs Princess, is a son of Hiawatha. Baron's Pride, sire of the dam of Torrs Princess, can justly be described as far and away the best breeding stallion ever known among Clydesdales the world over. No other horse has held the same record as he did for a like number of years as regards number, quality, and value of stock.

Torrs Princess (foaled May, 1912) is full sister to Radiant, the champion 2-year old colt at the Brandon Exhibition in Canada in 1912. She won second prizes in Sterling and Dalboatie as a 2-year old. She is in foal to the Cawdor Cup winner, Bonnie Buchlyvie, a son of the Baron o'Buchlyvie.

MONA (36914).

Sire, Ransom (13149); 1st dam, Meg (26325), by Gallant Poteath (8638); 2nd dam, Maggie, by Young Darnley (1874); 3rd dam, Fancy, by Lord Derby (485); 4th dam Bess, by Eclipse (268).

Mona's sire, Ransom, is by Baron's Pride, while her dam is by Gallant Poteath, a Glasgow Premium winner.

Mona (foaled 22nd April, 1910) won the following prizes:—First at Banff as 2, 3, and 4-year old; first at Cornhill as 3 year old; second at Turriff as 2-year old; third at Turriff as 3-year old. Mona is served by Gallant Stewart, champion at the Royal Northern Show, 1913, and a son of the Cawdor Cup winner, Revelanta.

Torrs Canty (36917).

Sire, Chattan Again (14626); 1st dam, Jenny Gray (22529), by Sir Hugo (10924); 2nd dam, Lady Lily of Balgrochan (2302), by Prince of Campsie (9824); 3rd dam, Rosie of Broomridge (17575), by Royal Erskine (7216); 4th dam, Jean of Redbrae, by Sir Wyndham (4728); 5th dam, Missie of Redbrae, by King of Scots (1172).

Torrs Canty's sire, Chattan Again, was a Glasgow Premium horse, while Sir Hugo, the sire of her dam, is by Sir Everard, by Top Gallant, by Darnley.

At Taylor's sale, in February, 1914, ten of Sir Hugo's sons averaged over 500 guineas each.

Torrs Canty (foaled 14th May, 1911) was first at Campsie, Kirkentilloch, and Kirkcudbright as a 3-year old. She is served by Donure Vintage, a son of Baron o'Buchlyvie, and fifth at the Highland Show.

Lady Caroline (36911).

Sire, Allandale (12418); 1st dam, Rose of Gollachy (33278), by Knight of Albion (9562); 2nd dam, Missie, by Strathspey (3227); 3rd dam, Jess, by Improver (391); 4th dam, Nell, by Comet (192).

Lady Caroline's sire, Allandale, is also by the famous Sir Hugo, by Sir Everard, by Top Gallant, by Darnley. Knight of Albion, the sire of Lady Caroline's dam, is a very famous horse by Prince of Albion, by Prince of Wales.

Lady Caroline is served by the Revelanta horse, Gallant Stewart.

Ostia (36920).

Sire, Mendel (14763); 1st dam, Jean of Girdstingwood (16844), by Baron's Pride (9122); 2nd dam, Mina of Girdstingwood (12552), by Macgregor (1487); 3rd dam, Trim of Girdstingwood (9915), by Belted Knight (1395 4th dam, Sally of Anchnabony (5576), by Lochfergus Champion (449).

Ostia (foaled 18th March, 1911) has never been shown. She is served by Baron o'Buchlyvie.

Lady Barnet (36910).

Sire, Hillhead (15254); 1st dam, Fanny III (19089), by Koh-i-noor (8742); 2nd dam, Fanny II (19088), by Goldenberry (2828); 3rd dam, Fanny I, by The Provost (2411); 4th dam, Ribbons, by Colonel (185).

Hillhead, the sire of Lady Barnet, is by Alex. Everard, by Sir Everard, by Top Gallant, by Darnley.

Lady Barnet (foaled 30th May, 1911) won several prizes at Wick and Thurso Shows. She, also, is served by Gallant Stewart, champion of Royal Northern Show in 1913.

The Use of the Hydrometer in connection with Lime-Sulphur Sprays.

In connection with the investigations in the manufacture and application of lime-sulphur, the Sub-Committee on Fruit Culture has considered the advisability of recommending the use of the hydrometer in cases where proprietary solutions of lime-sulphur are employed, or when the lime varies in composition. The following notes are largely based upon the work carried out by Mr. A. A. Ramsay, Assistant Chemist, Department of Agriculture.

Specific Gravity of Lime-Sulphur Solutions as an Index of Sulphur and Lime Content.

In the general investigations fifteen solutions, made in accordance with various formulæ, were analysed and also tested for specific gravity; and the inference to be drawn is, that although the specific gravity of a lime-sulphur solution is not, scientifically, an exact measure of the sulphur content, yet, in working with lime-sulphur solutions made by boiling lime and sulphur together with water, approximating the ratio of 1 : 2 : 10 parts by weight, the specific gravity of the fluid appears to be a quite satisfactory index to the sulphur content, and also for comparison.*

How to ascertain "Specific Gravity."

The "specific gravity," or "specific density," or simply "density" of a fluid is quickly obtained by the use of a hydrometer. This consists of a graduated hollow glass instrument, with mercury at one end to make the whole float vertically. The delicacy of the instrument depends on the bulb or float portion being large and the stem portion being thin.

In graduating these hydrometers, various standards have been adopted by the various originators or makers, whose name is generally appended to the particular pattern.

The hydrometer generally used by orchardists in measuring the density or strength of the spray fluids used by them is known as the Baumé hydrometer. It is rather unfortunate that this hydrometer has been chosen, inasmuch as very large differences in the methods have been adopted to determine the value of "one degree." The original instructions for standardisation given by Baumé have been altered and amended, giving rise to a certain amount of confusion.

* For further information on this subject readers may be referred to *Science Bulletin*, No. 13, "Lime-Sulphur Sprays: their Manufacture, Composition, and Use," by A. A. Ramsay, now in the press, and available, when published, on application to the Under Secretary.

In the case of Twaddell hydrometers the scale divisions are not of equal length, but the readings are direct. Pure water is taken as zero, and the sp. gravity is $1,000 + 5n \div 1,000$, n being the scale reading.

In other words, multiply the reading on the Twaddell instrument by five, add 1,000, and remove the decimal point three places to the left, and the result will be the specific gravity. Thus, a reading of 34·2 Twaddell indicates 1·171 specific gravity.

Finding the Density of Lime-Sulphur Solutions.

To ascertain the density of lime-sulphur solutions the following articles are required :—

(1) A Baumé or Twaddell hydrometer (Fig. 1 in plate). The cost is about 2s. 6d., and it may be purchased from any firm of scientific instrument importers.

(2) A glass hydrometer test jar, about 12 inches high and 1¾ inches diameter, in which to float the hydrometer. The cost of the jar is 1s. 6d., and it may be procured from the firm supplying the hydrometer.

If any difficulty is experienced in procuring the above direct, the local chemist and druggist could procure them for the orchardist.

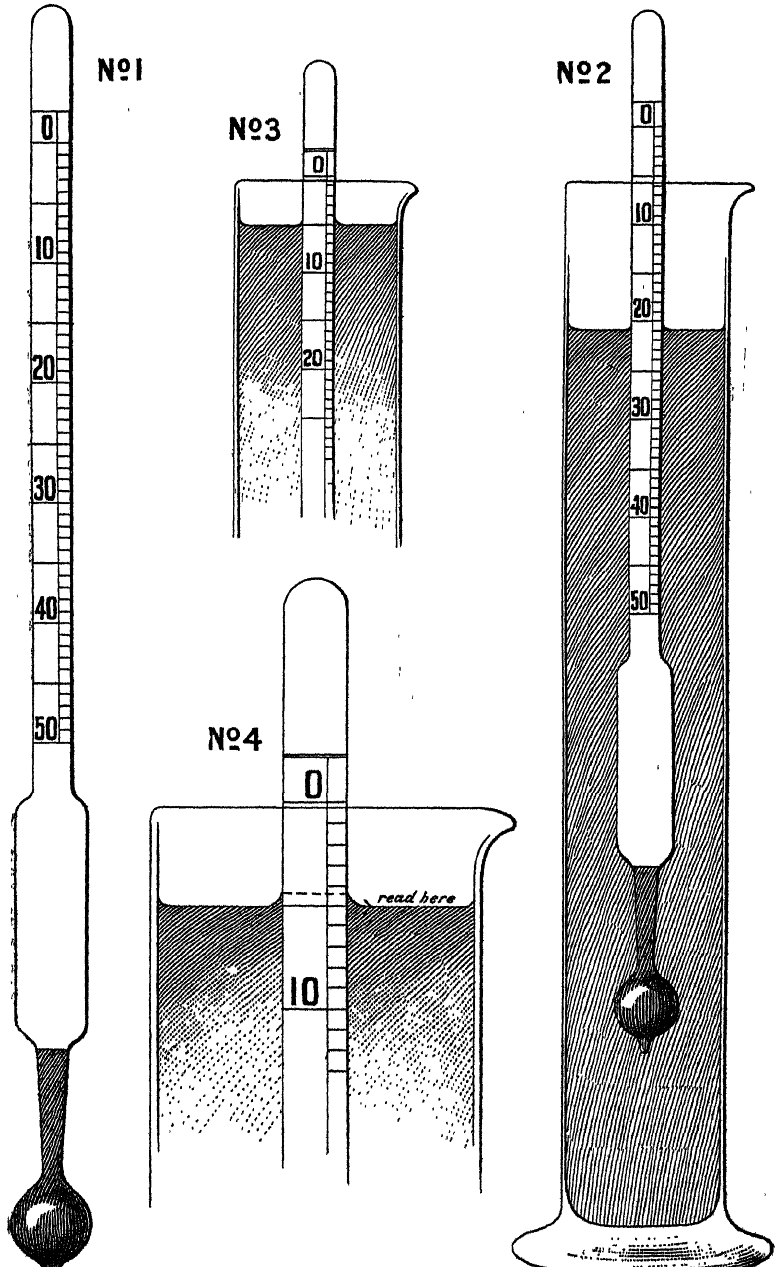
Before ascertaining the density of the "stock solution" or "mixture," the solution must be allowed to cool down to air temperature. Fill the jar to within about ½ an inch of the top and introduce the hydrometer, so that it floats free and does not touch the sides of the jar.

The surface of the fluid in the jar will be a horizontal plane, except at the point of contact of the fluid with the stem of hydrometer, where the glass stem causes the fluid to rise out of the horizontal, as illustrated on Fig. 3. Read the number of divisions on the hydrometer stem, where the horizontal plane would cut the stem of the hydrometer. Thus, in Fig. 4 the reading is 5 degrees Baumé.

How to Dilute Stock Solutions.

In order to produce the strength necessary for the winter and summer spraying of deciduous trees and the recommended strength for use on citrus trees, the following table has been compiled. All that is necessary is to ascertain the specific gravity of the concentrated solution by means of the hydrometer, and then to add the number of gallons specified in the table to each gallon of the stock solution.

The recommendations with regard to the manufacture of the lime-sulphur spray wer published in the issue for July, 1914.



No. 1.—Baumé Hydrometer for liquids heavier than water.
No. 2.—The same immersed in stock-solution of lime-sulphur.
No. 3.—Part of stem showing another strength of lime-sulphur (5 degrees Baumé)
No. 4.—Enlargement of No. 3, showing method of reading.

TABLE showing number of gallons and pints of water to be added to each gallon of stock solution of varying density to produce—

(*a*) "Summer" strength of approximately 1° Baumé.

(*b*) "Winter" " " $3\frac{1}{2}$° "

(*c*) "For Citrus Trees" strength of approximately $1\frac{1}{2}$° Baumé.

Specific Gravity.	Degree Baume.	Degree Twaddell.	Deciduous Trees. A. Summer strength. gal.	pints.	Deciduous Trees. B. Winter strength. gal.	pints.	Citrus Trees. C. gal.	pints.
1·014	2	2·8	1	0	0	0	0	4
1·022	3	4·4	2	0	0	0	1	2
1·029	4	5·8	3	0	0	1	2	0
1·037	5	7·4	4	0	0	4	2	7
1·045	6	9·0	5	1	0	6	3	5
1·052	7	10·4	6	1	1	0	4	3
1·060	8	12·0	7	2	1	3	5	1
1·067	9	13·4	8	1	1	5	5	7
1·075	10	15·0	9	2	2	0	6	6
1·083	11	16·6	10	3	2	2	7	4
1·091	12	18·2	11	4	2	5	8	3
1·100	13	20·0	12	6	3	0	9	2
1·108	14	21·6	13	6	3	2	10	1
1·116	15	23·2	14	7	3	5	11	0
1·125	16	25·0	16	1	3	7	11	7
1·134	17	26·8	17	3	4	2	12	7
1·142	18	28·4	18	4	4	5	13	5
1·152	19	30·4	19	6	5	0	14	5
1·162	20	32·4	21	2	5	3	15	6
1·171	21	34·2	22	3	5	6	16	5
1·180	22	36·0	23	5	6	0	17	4
1·190	23	38·0	25	0	6	4	18	5
1·200	24	40·0	26	3	6	7	19	5
1·210	25	42·0	27	6	7	2	20	5
1 220	26	44·0	29	1	7	5	21	5
1·231	27	46·2	30	5	8	1	22	7
1·241	28	48·2	32	0	8	4	23	7
1·252	29	50·4	33	4	8	7	25	0
1·263	30	52·6	35	0	9	3	26	1
1·274	31	54·8	36	4	9	6	27	2
1·285	32	57·0	38	0	10	3	28	3
1·297	33	59·4	39	5	10	6	29	5
1·308	34	61·6	41	2	11	1	30	6
1·320	35	64·0	42	7	11	5	32	0

Experience with Lime-Sulphur at the various Departmental Orchards.

Mr. W. J. Allen reports that from the results obtained from the tests made in Departmental orchards with the Lime-Sulphur Spray, when made up and applied in accordance with the sub-committee's recommendation, published in the July (1914) number of the *Agricultural Gazette*, it is shown that no damage has been caused. For winter application, he finds that 1 in 7 is as strong as it should be applied.

Rearing Queen Bees at Hawkesbury Agricultural College.

L. C. GODDARD, Apiarist.

THE apiary at Hawkesbury Agricultural College is laid out chiefly for queen-rearing. It is situated on a gently sloping piece of ground, terraced into four level plats, planted with couch, and sown with white clover to provide a sward in early spring. Young hedges enclose the apiary, and these are making vigorous growth. They are planted on the sides from which cold winds or driving rains are to be expected, while plenty of protection is provided by large trees to the west and south. Thus the apiary is open to the rising sun, and at the same time has as much shelter as possible.

Besides facilitating the work of rearing queen bees, the apiary had to be adapted for demonstrations to a number of students, and for this and other reasons the concrete hive stands were laid down at some considerable distance from each other, thus allowing a number of students to receive practical instruction at one hive without interfering with the bee flight to or from its neighbours.

One of the main points for consideration when laying out an apiary is to place each hive so that the apiarist, the returning field bees, and the newly-mated queens can readily pick out any one hive. This can be accomplished so far as the bees are concerned, by placing the colonies in any kind of order; but from the true apiarist's point of view this amounts to disorder, and often leads to confusion in queen-rearing. To satisfy the requirements of both apiarist and bees, the hive stands were laid in rows of ten, with palms and flowering shrubs planted amongst them. The latter form an excellent land mark for the bees, and considerably add to the appearance of the yard.

A stud book is as great a necessity to a queen breeder as it is to the breeder of horses; and colonies of bees are known by numbers, but the practice of painting the number on the outside of the brood chamber of a colony has so often led to a wrong entry in a stud book that a numbered plan was followed in this apiary that would enable the apiarist to pick out almost at a glance, any colony that he wished, without the aid of painted figures on hives or stands. For this purpose it was decided to place the colonies in rows of ten, with five on each side of a pathway, running through the centre of the yard, and with two rows to each terrace.

As an example of the way this plan answers, if the apiarist wishes to proceed from anywhere in the apiary to hive forty-three, he will know it as the third hive on the left of the pathway, in the fifth row from the front, or as we have two rows to the terrace, the fifth row will be the first row on the third terrace. Again, supposing number forty-seven is wanted, it will be found in the same row only on the other side of the path. This method of numbering may seem somewhat complicated when described in writing, but in practice it is soon found to be the most convenient. The old method of

painted numbers being done away with, we are able to interchange our material as we please. Even a short acquaintance with the apiary enables the apiarist to pick out his hives with certainty, especially with the help of the palms and shrubs planted among them.

The kiosk on the top, or fourth terrace, counting from the honey room, adds greatly to the appearance of the place, and helps as a land mark to home-flying bees. The inside of this kiosk is to be fitted up to receive observation hives, with their entrances on the outside. These hives, as well as being interesting to visitors, will be instructive to students, for through the glass sides one can watch the bees at their work.

On the first or lowest terrace is situated the honey-house. This is substantially built of concrete throughout, and consists of two rooms, each measuring 12 feet by 14 feet. Ample light and air are afforded through the many doors and windows. As well as having air and light, these rooms must be perfectly bee-proof, consequently gauze doors and shutters, furnished with bee-escapes, are provided so that bees that are carried into the rooms on the combs, as often happens, have a chance of getting out without the risk of others coming in. One of these rooms is used principally for extracting honey, for although the apiary is designed for queen-rearing, a fair amount of honey is naturally expected, as the strain of working Italians is of the very best. As most people know, the pure Italians will gather and store honey where and when the common black bee will only starve. Besides containing the extractor, uncapping press, honey tanks, &c., this room has a carpenter's bench for repairing and building hive bodies, frames, nursery cages, and the many things indispensable to an up-to-date apiary. The second room is used for storing combs and making comb-foundation.

The Practical Working of the Apiary.

The queen, or mother bee as she is sometimes called, for she is in reality the mother of all the bees in the hive, is the only perfect female bee in the colony, her sole function being that of laying eggs. So well does she accomplish this duty, that it is not uncommon to find queens who lay more than 3,000 eggs per day for weeks in succession during the height of the breeding season, provided they have sufficient young bees to do the nursing; indeed, a queen that cannot keep her nursing bees fully employed is not worth keeping.

The egg which is destined to produce a queen-bee does not differ from the egg intended to become a worker, but the young queen larva is supplied with a greater quantity of digested food than the larva of the worker. The larva can be seen floating in a bed of thick jelly, or chyme, a portion of which may usually be found in a dry condition at the base of the cells soon after she has hatched, while the food given to the worker larva after three days, and for the last days of its development, is coarser and not so plentiful.

In nature, the best queens are those that are reared either during swarming time or when the bees are about to supersede an old queen that is failing. In the latter case, both the queen and the bees seem to agree that the old queen must be supplanted by a younger and more prolific mother, but in either case large beautiful queen-cells, reminding one of big pea-nuts projecting

from the sides of the comb, are to be seen. The larvæ in such cells have been lavishly fed with royal jelly, and when the queens finally hatch they are usually large and vigorous.

Among the several systems of raising queens, the one first adopted by Mr. Doolittle many years ago, forms the basis of some of the best methods now in vogue, and it is this system, assisted by the ideas of others, that is used in this apiary. While the system is somewhat artificial, yet when worked properly it conforms as nearly as possible to nature's way. The most important thing in queen-raising is to bring about conditions that will approach, as nearly as possible, those that are present during the swarming time. One of the requisites, then, for cell building is to have strong powerful colonies, and another is a light constant honey-flow. If the weather does not permit of the latter, for the nectar will not rise in the flower without a certain amount of sun and heat, then we bring about a condition similar to that of a honey-flow, by stimulative feeding. When both these conditions occur we can start queen-rearing. A number of artificial cell-cups are made with a solid ball of wax, or a wooden cell-cup at the bottom. To make these, a smooth, slightly tapering stick of the right size is soaked in water, dipped a couple of times in melted wax, and then plunged into cold water, when the cell will be found to slip off the stick. The main thing is to secure a cup having a thick heavy bottom, but which will have a thin and delicate knife edge at the top or opening. To procure this either the wooden cell-cup is used, or after dipping a small ball of wax is stuck to the bottom of the cup, and the whole dipped in melted wax again to make the ball and cup one piece. This solid bottom enables the cell to be handled without danger of damaging the queen inside. These cells are stuck on sticks that slip into frames prepared for them ; generally two sticks of eight or ten cells each are given at a time.

The next operation is to insert a small particle of royal jelly in every cup so made. The amount in each should be about equivalent to a BB shot. This is put in on the end of a stick (slightly smaller than the cell-forming stick) which is twirled round so that the jelly spreads all over the bottom of the cup, similar to the way in which the bees themselves put it in. This royal jelly should come from a queen-cell nearly ready to cap, as that will contain the most. It should be stirred to bring it to a uniform consistency.

A comb of very young larvæ, the younger the better, is now taken from the hive which it is desired to breed. This frame of larvæ must be kept in an atmosphere not cooler than 75 degrees ; therefore, if the weather is a little cold, the comb is put in a comb bucket which has already in it a hot brick wrapped in cloth, and taken to a warmed room, where the work of grafting is to be done. The bees can either be brushed off carefully, or supposing only one frame is to be grafted, then there will be plenty of time to do the grafting while the bees on the comb are filling themselves with honey which they will do before they start flying. If the weather is warm, the work can be done on the shady side of the hive.

With the grafting needle the larvæ are carefully lifted out of the worker-cells and put into each of the prepared cups, one at a time. It will be found that the royal jelly which has been put in the cups serves a double purpose.

It affords a soft bed in which to lay the larva, and at the same time provides food until the bees can give it a fresh supply. It is possible to get cells accepted without the jelly, but greater success is ensured by using it. After these sticks of grafted cells have been put in the frame prepared for them, they are ready for the bees to proceed where man has left off.

Getting these cells accepted is more difficult than getting them fed after once started. Still there are many ways of doing this. If we have a colony preparing to swarm or to supersede the queen, they will start and feed almost an unlimited number of cells, giving them one frame at a time, but in a swarming colony the cells must be removed as soon as they are capped, or even before then, as otherwise the bees will swarm and leave the hive too weak to feed the younger cells properly. If we have neither a swarming nor a superseding colony, then we use the "Swathmore Swarm Box." A hive which has its queen and brood taken from it for a couple of hours will start cells, provided plenty of honey is coming in or that they are fed for a few days before getting them ready, and the success is greater if all the bees are shaken off the combs in front of the entrance and allowed to run in. These cells can be taken away the next day, and the queen and brood given back to the colony, or they can be left in the same hive provided a queen-excluder is put between them and the queen; for once cells are started they will be well looked after if put between two frames of unsealed brood above a queen-excluder in almost any strong colony. For five days this larva is lavishly fed, after which the cell is capped, and remains so for seven days On the sixth day after capping these cells must be separated, or the first virgin queen that emerges is likely to destroy the rest of the cells. When separated the cells are either caged in nursery cages, or given to queenless nuclei. The latter, when possible, is the better plan, as the queen that is in a cage is likely to wear herself out trying to make her escape.

To give a cell to a nucleus or colony that has only been queenless a short time, it is often necessary to put the ripe queen cell in a West cell-protector from which a queen can hatch and escape through the bottom, though the bees cannot get at the sides of the cell to tear it down. In destroying a cell, they always work on the side, the nose or bottom seeming to be too tough for them to tear away. The use of the cell protector, however, is only necessary in the case of a strong nucleus; in a weak queenless colony it will not be required. In giving a cell to a colony it should be placed so as to be in the centre of the cluster, and it will be found to be there if put about the centre of a frame, with the nose just extending down a little over some brood.

About the ninth day after the young queen is hatched, if the weather has been fine, she should commence laying. She is then ready to be sent out as an untested queen, but if a tested queen is required she must be kept long enough for her progeny to hatch and so prove that she has been mated to a pure drone.

In conclusion, let it be said that in a queen-rearing apiary about the most important factor is that any colony which is not up to the standard should not be allowed to have drones flying. There is then very little danger of having the queens mis-mated.

Herd-testing Associations on the Tweed-Richmond Area.

Details of the Highest-yielding Herd for the Twelve Months ending 28th February, 1914.

L. T. MACINNES, Dairy Instructor, Byron Bay.

In the Associations affiliated with the Tweed-Richmond Herd-testing Council, completing a twelve months' test prior to 28th February, 1914, the honour of owning the highest-producing herd belongs to Mr. J. Anderson, of Duranbah, Tweed River (Condong Herd-testing Association).

The following are the details of the yields of his cows during that period, together with other data necessary to give as far as is possible a true idea of their individual merit from the information available:—

Mr. J. Anderson's Herd, Duranbah, Tweed River (Condong Herd-testing Association), from 1st March, 1913, to 28th February, 1914.

No. of Cow.	Month of Calving.	Months Dry.	Milk.	Butter.	Remarks.
			lb.	lb.	
1	October ...	Sept., Oct....	4,230	327·3	
2	September..	July, Aug., Sept.... ...	7,125	340·1	
3	August ...	May, June, July	6,490	332·1	Heifer.
4	July ...	June, July	6,690	383·7	
5	August ...	May, June, July, Aug. ...	5,925	271·8	
6	,, ...	,, ,, ...	6,240	278·4	
7	November..	Oct....	9,755	472·2	
8	October ...	Aug., Sept.	5,310	267·9	
9	November..	Oct., Nov.	6,240	343·2	
10	1912 ...	Sold Feb.	5,835	296·4	Would not go in calf. Speyed, and sold to butcher in February.
11	October ...	Aug., Sept.	6,810	309·9	Heifer.
12	November..	Sept., Oct., Nov.	7,275	335·4	
13	August ...	July, Aug....	6,880	308·1	
14	December...	Sept., Oct., Nov.	5,700	275·7	
15	August ...	July, Aug....	6,915	363·6	
16	November..	Sept., Oct....	5,790	333·6	
17	,, ...	Oct....	7,845	352·2	
18	July ...	June, July	6,805	373·5	
19	November..	Sept., Oct....	8,220	423·3	
20	September..	Aug., Sept.	7,245	322·8	
21	August ...	July, Aug....	8,160	373·2	
22	September..	July, Aug., Sept.... ...	5,565	287·1	
23	December...	Aug., Sept., Oct., Nov. ...	3,660	168·9	Speyed, and sold to butcher, February.
24	July ...	May, June, July	5,565	292·2	
25	October ...	Sept.	2,375	446·7	
26	September..	July, Aug., Sept.... ...	6,000	308·1	Heifer.
27	November..	Sept., Oct., Nov.	5,340	269·1	
28	September..	May, June, July, Aug. ...	4,995	258·9	
29	December...	Nov.	8,670	387·6	

Mr. J. Anderson's Herd—*continued.*

No. of Cow.	Month of Calving.	Months Dry.	Milk.	Butter.	Remarks.
			lb.	lb.	
30	January ...	Sept., Oct., Nov., Dec. ...	6,345	305·7	
31	August ...	May, June, July	6,660	343·8	
32	,, ...	May, June, July, Aug. ..	6,115	299·7	
33	September..	May, June, July, Aug.—Feb.	3,450	142·2	Heifer.
34	March ...	Mar.—Nov., Dec., Jan., Feb.	4,155	207·0	
35	January ...	Sept., Oct., Nov., Dec., Jan.	4,155	177·6	Speyed.
36	December..	Oct., Nov.	5,975	268·5	
37	March ...	Mar.—Nov., Dec., Jan., Feb.	3,630	154·8	
38	March, 1913, Jan., 1914.	Mar.—Dec., Jan.	4,740	195·3	Heifer.
39	April ...	,, ,, ,, Feb. ...	4,380	213·3	
40	,, ...	,, ,, ,, ,, ...	4,395	214·3	Destroyed broken leg.
41	,, ...	Mar.	5,740	311·5	Heifer.
42	May ..	Mar.—Jan., Feb.... ..	5,855	245·9	
43	April, 1913, Jan., 1914.	Mar. Oct., Nov., Dec., Jan.	2,540	142·6	Heifer.
44	May ...	Mar., April, May—Jan., Feb.	4,830	256·1	
45	,, ...	Mar., April, May.. ...	5,190	295·7	Heifer.
46	,, ...	,, ,, ,, —Feb....	4,530	252·3	
47	,, ..	,, ,, ,, ...	4,710	228·4	
48	,, ..	,, ,, ,, —Feb....	4,890	297·1	
49	June ...	Mar., May, April—Dec., Jan., Feb.	2,325	116·7	Heifer.
50	,, ...	Mar., April, May, June...	6,412	246·6	
51	,, ..	,, ,, ,, ,, ...	3,825	190·8	Heifer.
52	,, ..	,, ,, ,, —Feb....	3,120	140·2	,,
53	,, ...	,, ,, ,, June ...	4,500	206·1	,,
54	July ...	,, ,, ,, ,, ...	4,805	196·5	
55	,, ...	,, ,, ,, ,, ...	5,255	236·1	Heifer.
56	August ...	Mar., April, May, June, July, Aug.	5,325	226·8	,,
57	September..	,, ,, ,, ,, ...	3,555	207·6	,,
58	August ...	,, ,, ,, ,, ..	4,815	219·9	,,
59	October ...	Mar., April, May, June, July, Aug., Sept.—Feb.	1,905	120·9	,,
60	,, ...	Mar., April, May, June, July, Aug.. Sept.	2,730	126·9	,,
61	,, ...	Mar., April, May, June, July, Aug., Sept., Oct.	3,225	182·4	,,

In the following table giving the records of some of the dams and their heifers in Mr. Anderson's herd, all the dams are grade Shorthorns, and the heifers are the result of mating them with the Jersey bull Golden Count (2nd prize, Grafton Show, 1910). This sire was born November, 1909, and is a descendant of Golden Lord, bred by the New South Wales Government.

Of the heifers, Nos. 41, 57, and 58 were all on their first calves, and No. 45 on her second. Nos. 57 and 58 were milking well at the time (February 28) these records were closed; No. 41 was nearly dry; No. 45 was nearing the stripping stage. The total lactation periods of dams Nos. 9, 32, and 13 cover portions of two calvings.

Records of Dams and their Heifers tested during the year ending 28th February, 1914 (Mr. J. Anderson's Herd).

Cows.	No.	Date of last Calving.	Total lactation period.	Yield. Milk.	Butter.	Cash Value	Remarks.
			Months	lb.	lb.	£ s. d.	
Dam ..	9	Nov., 1913	10	6,240	343·2	16 12 9	
Heifer ...	41	Mar., "	11	5,740	311·5	15 2 7	First calf.
Dam ...	32	Aug., 1913	8	6,115	299·7	14 15 7	
Heifer ...	57	" "	6	3,555	207·6	9 19 8	First calf. Record incomplete.
Dam ...	40	Mar., 1913	8	4,395	214·3	10 11 6	
Heifer ...	45	May, "	9	5,190	295·7	14 5 4	
Dam ...	13	Aug., 1913	10	6,880	308·1	15 8 4	
Heifer ...	58	" "	6	4,815	219·9	10 19 4	First calf. Record incomplete.

No. 40, whose yield shows as lower than that of her daughter, had the misfortune to break her leg, and had to be destroyed while still milking well. She also was not in normal condition during part of the period she did test, so that the amount shown to her credit does not indicate her true worth. This is one illustration of the value of breeding only from the best. Here is another, taken from the same herd. The heifers are by a Shorthorn bull bred by Mr. Dixon Cooke, of Alstonville, New South Wales. The dams and grand dams are ordinary grades.

In two instances three generations, milking during the same year and under much the same conditions can be compared:—

Cows.	No.	Date of last Calving.	Total lactation period.	Yield. Milk.	Butter.	Cash Value.	Remarks.
			Months.	lb	lb.	£ s. d.	
G. dam ...	10	1912 ..	11	5,835	296·4	14 10 9	Would not go in calf again. Speyed, and sold to butcher, February, 1914.
Dam ...	20	Sept., 1913	10	7,245	322·8	16 3 4	
Daughter..	26	" "	9	6,000	308·1	15 1 9	On second calf.
G. dam ...	29	Dec., 1913	11	8,670	387·6	19 8 0	
Dam ...	19	Nov., "	10	8,220	423·3	20 14 4	
Daughter..	38	{ Mar., " / Jan., 1914 }	9	4,740	195·3	9 18 3	On first calf. (See note.)
Dam ...	2	Sept., 1913	9	7,125	340·1	16 16 10	
Daughter..	3	Aug., "	9	6,490	332·1	16 5 5	
Dam ...	35	Jan., 1914	7	4,155	177·6	8 19 2	Culled out.
Daughter..	23	Dec , 1913	8	3,660	168·9	8 8 2	On fourth calf. Culled out.

These tables are good illustrations of hereditary productiveness. The heifer No. 38 on her first calving came in very young and had a very bad time.

The last pair, Nos. 35 and 23, give an example of breeding from what, in this particular herd (though it is to be regretted that on many other farms they would be far above the average), are called the unpayable class. Both these cows were speyed, fattened, and sold to the butcher.

Hints on Harvesting and Curing Tobacco.

Maturity will be reached some three to five weeks after topping. The varieties which have been distributed by the Department this season, and which have been planted under suitable conditions, should show lighter shades of green as it reaches maturity, a golden sheen being noticeable when the leaf is inspected in certain lights, and in some cases a yellowish blotchy discoloration or yellow spots. When folded between the fingers the leaf should crack across and not merely leave the mark of the fold.

The method at present adopted in the State is to harvest the whole plant together. A much better one is that known as "priming," which consists of harvesting the leaves as they mature, for the whole of the plant does not ripen at the same time. Where the more common method is practised a fine discrimination must be exercised in order that the largest proportion of leaves on the plants shall be cut at the right stage; as a rule it will be found that the plant should be cut when the middle leaves have matured. A combination of the two methods will give satisfactory results, and is recommended. When the bottom leaves have matured they should be primed off and strung, and the upper leaves could be left until they are ready, when they could be taken off with the stalk as in the case of harvesting the whole plant.

Where curing is effected by means of an open shed, as is the present custom in this State, the tobacco should be cut late in the afternoon and hung on the sticks close together. When it has wilted it will be possible to pack closer without damaging the leaves until they have assumed a yellow colour. When this change has taken place each stalk should be separated by a space of six inches and the sticks removed to the barn where the distances apart should not be reduced. Growers should note that the sticks, when in the barn, must have sufficient space to allow of a free current of air; crowding the leaves together in the shed is a great mistake. Tobacco that shows every promise on the scaffold of curing a good colour is often spoilt by neglect of this precaution, and the result is a dark dingy-coloured leaf.

You may pack your leaf very close on the scaffold, but give plenty of room on the stick and between the sticks when hanging in the shed.—C. J. Tregenna, Tobacco Expert.

Australian Butter at the Last London Dairy Show.

M. A O'CALLAGHAN.

DETAILS are now to hand, through the courtesy of the Agent-General, which give the points allotted to each factory competing in the Colonial Butter Classes at the Dairy Show held in London last October. Though I am not a believer in the value of show competitions as being anything other than a test of the butter-maker's ability to manufacture a good butter from specially selected cream, still it is very pleasing to know that, even if the competition showed nothing else, it has illustrated the fact that New South Wales butter-makers are able to hold their own in the way of manufacturing processes, and in the matter of selecting cream with those of other States. No doubt owing to shipping delays consequent on the war, the Queensland butters did not arrive in time to take part in the competition, and of the entries that were staged in the "Salted" class, eighteen represented Victoria, and five hailed from New South Wales. With such a small representation it was most satisfactory to find that New South Wales gained first and second places.

It is worthy of note that both the factories scoring so well have had representatives at the Dairy Science Schools held by the Department, and these representatives have gained certificates in Cream Grading. Undoubtedly the grading and selection of the cream for the manufacture of the butter plays the biggest part in a competition of this kind.

In the "Unsalted" class there were fifteen Victorian and five New South Wales competitors. Singleton Central Butter Factory (New South Wales) was again second in this class, and Denman Co-operative Dairy Company (New South Wales) filled third place, the first position having gone to the Swanpool and Moorngag Butter Factory, Victoria.

The Commonwealth standards for classifying butter for export allow 30 points out of 100 for texture, and if a factory is penalised 2 points out of the 30 for defective manufacture in the way of texture, the directors generally feel somewhat aggrieved, and butter graders, according to my experience generally, are rather too lenient in this direction. I have always pointed out that, according to British standards, texture plays a very prominent part in the judging of butter, but owing to our general export butter being frozen when it is examined on its arrival in England, judgment as to texture is practically of little use. As a consequence, reports on Australian butter, made while such butters are hard frozen, do not represent English opinion when these butters are afterwards de-frozen and cut up for consumption. The butters in question were de-frozen before judging.

We have, in these figures, an illustration of a factory losing 7 points out of 20 for texture, whereas not a single factory competing in the "Salted" class obtained full points for texture, and only one factory succeeded in getting the maximum number of points in the "Unsalted" class.

TABLE A.—Showing Awards in Colonial Sections, Dairy Show, London, 1914, for Salted Butter:—

Entries: 18 Victorian, 5 New South Wales.

Award.		Flavour.	Texture.	Colour.	Salting.	Packing.	Total.
		55 pts.	20 pts.	10 pts.	10 pts.	5 pts.	100 pts.
1.	Lismore Co-operative Dairy Co., Ltd., N.S.W.	54	19	10	10	5	98
2.	Singleton Central Co-operative Dairy Co., Ltd., N.S.W.	54	18	10	10	5	97
3.	Gormandale Butter Factory ..	54	18	10	10	4	96
4.	Tamleugh and Karramomus Butter Factory Co., Ltd.	52	19	10	10	5	96
H.C.	Swanpool and Moorngag Butter Factory Co., Ltd.	54	18	8	10	5	95
H.C.	Alexandra Dairy Co.	53	17	10	10	5	95
—	Upper Maffra Co-operative Butter Factory Co., Ltd.	53	15	8	10	5	91
—	Sale District Butter Factory, Ltd.	54	13	7	10	4	88
—	Tallangatta Butter Factory ...	53	17	7	10	5	92
—	Swan Hill Co-operative Dairy Co.	53	17	8	10	4	92
—	Camperdown Butter Factory Co., Ltd.	52	17	8	10	5	92
—	Trafalgar Co-operative Butter Factory Co., Ltd.	52	16	8	9	5	90
—	Newstead Co-operative Butter Factory Co., Ltd.	52	16	8	10	5	91
—	Milawa Co-operative Dairy Co.	51	18	9	7	5	90
—	Cowarr Butter Factory Co. ...	50	19	10	8	5	92
—	Yea and Mansfield Dairy Co. ..	51	16	10	10	3	90
—	*Yarragon Co-operative Butter Factory.	53	19	10	10	4	96
—	Eskdale Butter Factory	51	17	9	10	5	92
—	Kiewa Butter Factory	52	16	9	10	5	92
—	Denman Co-operative Dairy Co., Ltd., N.S.W.	50	16	10	10	5	91
—	Dungog Co-operative Butter Factory, Ltd., N.S.W.	52	17	10	10	5	94
—	Penshurst Butter Factory ...	53	17	8	10	5	93
—	Avon and Barrington Co-operative Butter Factory, Ltd., N.S.W.	53	17	10	10	4	94

* Disqualified because the surface of the butter was not plain.

TABLE B.—Showing Awards in Colonial Sections, Dairy Show, London, 1914, for Unsalted Butter:—

Entries: 15 Victorian, 5 New South Wales.

Award.		Flavour. 60 pts.	Texture. 25 pts.	Colour. 10 pts.	Packing. 5 pts.	Total. 100 pts.
1.	Swanpool and Moorngag Butter Factory Co.	56	24	10	5	95
2.	Singleton Central Co-operative Dairy Co., Ltd., N.S.W.	56	23	10	5	94
3.	Denman Co-operative Dairy Co., Ltd., N.S.W.	55	23	10	5	93
R. & V.H.C.	Alexandra Dairy Co.	54	23	10	5	92
H.C.	Tamleugh and Karramomus Butter Factory Co., Ltd.	52	24	10	5	91
—	Upper Maffra Co-operative Butter Factory Co., Ltd.	50	24	10	5	89
—	Sale District Butter Factory, Ltd. ...	50	22	10	5	87
—	Tallangatta Butter Factory	52	22	10	5	89
—	Camperdown Butter Factory Co., Ltd.	50	22	9	5	86
—	Trafalgar Co-operative Butter Factory Co., Ltd.	52	23	9	5	89
—	Newstead Co-operative Butter Factory Co., Ltd.	50	24	9	5	88
—	Milawa Co-operative Dairy Co. ...	50	25	10	5	90
—	Cowarr Butter Factory Co.	48	24	10	5	87
—	Yea and Mansfield Dairy Co.	52	20	10	4	86
—	Yarragon Co-operative Butter Factory	52	23	10	5	90
—	Gormandale Butter Factory	52	23	10	5	90
—	Eskdale Butter Factory	45	24	10	5	84
—	Kiewa Butter Factory	52	22	9	5	88
—	Dungog Co-operative Butter Factory, Ltd., N.S.W.	52	23	10	5	90
—	Lismore Co-operative Dairy Co., Ltd., N.S.W.	54	20	10	4	88
—	Penshurst Butter Factory	...	...	...	...	...
—	Avon and Barrington Co-operative Butter Factory, Ltd., N S.W.	54	23	9	4	90

SEED TESTING FOR FARMERS.

THE Department is prepared to test vegetable and farm crop seeds. Reports will be given stating the germination capabilities of the seed, its purity, and the nature of the impurities, if any.

Communications should be addressed to the Director, Botanic Gardens, Sydney. Not less than 1 ounce of small seeds such as lucerne, or 2 ounces of large seeds like peas, should be sent. Larger quantities are to be preferred. Seeds should be accompanied by any information available as to origin, where purchased, age, &c.

If a purity report only is desired, it should be so stated, to secure a prompt reply. Germination tests take from six to twenty days, according to the seed.

The Construction of Poultry Buildings.

[Continued from page 64.]

JAMES HADLINGTON, Poultry Expert.

A SYSTEM of running poultry that might, with very great advantage, be adopted by many poultry-keepers where sufficiently large areas are available, is what is known as the "colony" system, which is often spoken of, but little understood or practised. It is most applicable to the "one-breed-farm," rather than to where many breeds are kept, as it is desirable, though not absolutely necessary, that only birds of the same breed should be kept in the one class.

To be successful, the following classification would be required, each of which would need to be enclosed or partitioned off:—

(*a*) Male young stock, 10 to 20 weeks old.
(*b*) Female young stock, 10 weeks old to laying stage.
(*c*) Pullets, from laying stage to end of first year's laying.
(*d*) Hens in second and third year.

These are the ages and conditions, all requiring somewhat different treatment. Any system that fails to provide for such a classification will break down sooner or later.

The colony system, with suitable enclosures or partitions, amounts practically to free range conditions. It may not be practicable on many farms to adopt this system for all the conditions enumerated above, but one or more of them might be adopted—the most important being the ages 10 to about 20 weeks in both sexes. This is the age at which it is desirable to secure the best possible development.

Placing the Houses.

In this system the houses should be placed in different positions in each enclosure, preferably, but not necessarily, in lines. This would depend much upon the contour and aspect of the land set apart for this purpose. For the young stock, small movable houses, each to accommodate 50 to 75, will prove most suitable and convenient, as it is undesirable that too many of this age should be housed in one flock; but with the more mature stock, large permanent houses, to accommodate up to 200 or 250, might be used with advantage, as there is little or no danger of epidemic diseases appearing among these when ordinary precautions are taken and rules of cleanliness observed.

Locating the Birds.

The method by which the birds can be induced to take to the different houses, instead of all crowding into certain houses, is simple when once under-

stood, and consists in taking advantage of the "locality" instinct of the birds. This can be best accomplished, in the case of the small houses, by using movable frames, which can be erected in a few minutes, to form an enclosure to the house. These are kept up for a few days, until the birds in that particular house have got their locality; they can then be taken down and moved on to another house, and so on until the whole of the houses are filled in that particular enclosure, which might contain anything up to 1,000 growing stock. This works conveniently in practice, because the chickens are scarcely ever wanted to be put out all at once, but in small batches as they come from their previous quarters, so that it is quite unnecessary to have many of these frames made for the purpose, and no considerable expense is thus entailed. In the case of adult fowls, however, it is desirable to have small permanent enclosures erected in front or at back of the house for the same purpose, and for the convenience in selecting or handling the birds as becomes necessary. When once these have got their locality, the gates can be opened and the birds allowed to run freely into the larger enclosure or range. This is a system which should appeal to orchardists; houses could be established at different points around the plantation for either layers or growing stock, but it should be understood that both cannot be run together successfully, on account of the different methods required in feeding each.

The colony system has been adopted for the rearing section from 12 weeks upwards on the newly-erected poultry demonstration plant at the Hawkesbury Agricultural College. For this purpose about 6 acres of land has been set apart, and divided into six enclosures of about 1 acre in extent. The houses are placed at intervals of about 2 chains apart, and frames are used, as already described, to form the small enclosure around the house for a few days, until the birds are accustomed to their locality. The frames are then removed, and can be used again for the same purpose, as already described. The large number of enclosures necessitated for this purpose there, is owing to a number of breeds being kept. The frames used are constructed of 3 x 1 Oregon battens, with the exception of the one for the bottom, which is of hardwood. These frames are 18 feet long by 6 feet 4 inches wide, with two bars 6 feet from each end, and covered with 72 x 2 x 18 wire netting, but 19 gauge could be used for the purpose. These frames are simply put in position, raised up, and tacked with a nail at each corner.

The construction of these frames is a very simple matter, as will be seen, and can be made by any handy man. The quantity of 3 x 1 battens used in each frame of 18 feet x 6 feet 4 inches is about 60 running feet; the cost of this timber in Sydney is about 20s. per hundred super., which means 400 running feet; 60 feet at this rate works out at 3s.; 6 yards of wire-netting, 72 x 2 x 19 at 3½d. a yard amounts to 1s. 9d., total 4s. 9d. Three of these frames, with the house acting as one side, will form a collapsible yard at a cost of about 14s. 3d. If there is no door provided at the back of the house, a small gate 24 inches wide made with a frame of 3 x 1 Oregon battens and covered with wire-netting should be let into one of the frames, for convenience

in attending to the birds during their confinement. These enclosures of 1 acre in extent are sufficient to accommodate about 500 chickens from about 10 to 15 weeks old, after which the numbers will require to be thinned down to adult proportions, which means about 250 for the area mentioned.

Useful in any Poultry Yard.

These collapsible yards should appeal to the poultry-keeper on a small scale no less than those operating in a larger way, particularly to the suburban poultry-keeper where he may have no fixity of tenure, and may require to move from one place to another. The facility with which these yards can be moved should facilitate poultry-keeping, where the putting down of yards would be a deterrent. In a similar way, small houses can be built with two ends and a back section, and be easily taken down and put up again. There is scarcely a poultry-yard where these yards and houses would not be of considerable utility in meeting the varying conditions and circumstances that are continually arising, and provide means of overcoming many little difficulties in the yarding, housing, and separating of small batches of stock.

Romneys at the Hawkesbury Agricultural College.

Poultry Notes.

JAMES HADLINGTON, Poultry Expert.

FEBRUARY.

MANY of the questions asked by a correspondent in a recent letter to this Department are typical of large numbers received from time to time, and as the replies to them convey a considerable amount of useful information, and are for the most part seasonable topics, it has been decided to reproduce them.

Question (1).—Apart from cleanliness and good housing, what preventive measures may be adopted against diseases, such as roup, &c.?

(2) During the summer months should the poultry be given Epsom salts at intervals; if so, what quantity should be given, how often, and during which months?

(3) Is it advisable to add Condy's fluid to the drinking water; if so, what quantity should be given, how often, and during which months?

Answers.—Mature poultry are by no means as subject to epidemic diseases as is commonly supposed, and the alarmist statements sometimes made under this head are deprecated, as is also the constant use in the drinking water of germicides such as sulphate of copper and permanganate of potash. All that is necessary is ordinary cleanliness, airy quarters, sound feeding, and an occasional laxative. With the stock under 9 months old the case is somewhat different, as they are susceptible to epidemic diseases, such as roup and chicken-pox. These two are their great enemies, and to guard against them constant vigilance is necessary.

In regard to roup, as unhealthy conditions such as overcrowding, ill-ventilated quarters, and too much scrub and undergrowth in the runs are the leading contributing factors in its occurrence, the way to minimise the risk of an outbreak is indicated. It should be understood that dosing the stock with the chemicals mentioned will not ensure immunity from roup. Permanganate of potash crystals are much over-rated as a preventive of diseases in poultry; the utility of this chemical lies in its germicidal qualities in disinfecting the slime and mucus from the nostrils of roupy fowls. Obviously, then, its usefulness is confined to actual outbreaks of the disease, and for this purpose the water should be impregnated to the extent of from pink to claret colour, and used consistently during the presence of the disease; but the actual curative properties of permanganate of potash are negative.

As regards chicken-pox, the same conditions also favour it. Chicken-pox is a definite blood disease, and, as far as this State is concerned, is confined almost exclusively to the autumn months, and to birds under 9 months old. It is preventable by a liberal use of Epsom salts and flowers of sulphur, and they should be used for several weeks prior to the time of its expected appearance. The protective measures should, therefore, be commenced

about the middle of January. Epsom salts should be given every third day in the drinking water, at the rate of 1 ounce to the gallon, and this can be varied by giving flowers of sulphur during some of the weeks, at the rate of 1 ounce to 8 lb. of dry matter forming the morning mash, which can be mixed in the usual way. However, care should be taken not to overdo the sulphur, or the pullets may break into a moult. This treatment should continue to about the middle of April, after which Epsom salts may be given once or twice a week, as in the case of adult fowls.

Question (4).—Last hatching season my first lot of birds hatched out on 2nd August. Some few of these are laying now (29th December). Are these birds not laying at a very early age, and will not this early laying affect them as egg-producers?

Answer.—It may not affect them so much in regard to quantity of eggs produced, but it is almost certain to do so as regards the size of the egg. Small eggs are mostly indicative of degeneracy, and birds laying them should on no account be used as breeders.

Question (5).—What is the probable cause of the pullets laying at such an early age?

Answer.—It is not unusual for a few pullets out of a flock to lay so early, but this precocity is inimical to their proper development, and is principally confined to weedy, inbred, or degenerate specimens.

Question (6).—I am much concerned about a method of selecting good layers, *especially for breeding purposes*; can the Department furnish me with any information regarding this matter?

Answer.—You cannot expect to be successful in the selection of layers without some experience of the different types of bird. Most theories of selecting layers have a basis of fact, and are helpful to the beginner up to a certain point, and this is where experience is necessary.

"Know your breed" is the motto that should be inscribed over all of them. It should also be understood that there is a "laying" type, and some breeds conform more closely to it than others; notably, a typical White Leghorn. However, some characteristics are common to all good layers, and the points for judging a fowl for its laying qualities at sight may be summarised as follows:—

(*a*) Pullets to be selected should be in good health and condition, and not under 6 months old.

(*b*) Start at the head—this is undoubtedly the best index; the head of a layer of whatever breed should indicate activity and alertness, by what may be described as a lean expression of face, which should be fine in texture and free from wrinkles. The comb should be correspondingly fine in texture, with bright eyes—large and expressive. Any coarseness in face and comb, particularly if accompanied by a thick skull and heavy eyebrows is a sure indication of an indifferent layer.

(*c*) The neck should be fairly long and not too thick.

(*d*) The body should be deep and fairly long, showing deepness in the abdominal part when viewed from behind. The skin underneath the breast-bone should be fine and pliable; this part should not be hard.

All these qualities can be seen in the yard and at a glance, and, consequently, to the experienced eye are easily picked out. The poultry-man who is unable to select on these lines is not likely to meet with much success on any others. It will be found on handling such hens as described, that they have fine, straight pelvic bones, which may be rigid, pliable, or expanded, according to the stage of laying the birds happen to be in. The weights should be according to the breed. It is desirable that Leghorns should weigh at least 4 to 4½ lb. at 7 months old, while dual-purpose breeds, to be considered good layers, should not exceed 5½ lb. at the same age.

Question (7).—I am considering an experimental lot of birds for table purposes, and would ask for the following information, together with any other the Department may care to furnish:—Which is the most profitable breed to operate on for table purposes?

Answer.—There is more than one profitable breed. The most profitable breeds are what is known as the dual-purpose fowls, such as the Orpingtons (Buff or Black), Rhode Island Reds, Red Sussex, Wyandottes, or Plymouth Rocks. The reason for this classification of these breeds, as being the most profitable for table purposes, is that the pullets are from good to medium layers, and because table poultry cannot be regarded seriously by itself. After all, there is most profit in keeping the pullet portion as layers.

Question (8).—What is the best time to hatch for this purpose?

Answer.—1st June to 30th September, and from 1st February to the end March.

Question (9).—At what age should these birds be put on the market?

Answer.—At from 4½ to 6 months old.

Question (10).—Can the Department furnish me with any figures of a late date, giving me some guide as to the profits attached to the breeding of table birds?

Answer.—Yes; consult the paper on "The Cost of Production and Values," read at the Poultry Farmers' Conference at Hawkesbury Agricultural College last July, and published in the *Agricultural Gazette*, August, 1914, page 705. To the feed values there given, add any extra percentage in cost of same.

Question (11).—In selecting breeders for this purpose, should 2-year hens be used, and is their weight the main factor to consider when selecting them?

Answer.—It is not absolutely necessary that 2-year hens should be used. Well-developed pullets are quite fit to breed from after 10 months old; but mark the stipulation, "well-developed pullets." Weight and large frame in the female are the most important factors in the production of size.

NOTE.—It is a mistaken notion that our markets call for extra heavy-table birds. Birds weighing 4 to 6 lb. live weight at as many months old will command relatively the highest prices, and these weights are easily made at the age indicated by the dual-purpose breeds mentioned above. The reason for the outcry as to the shortage of good table birds is, that the great bulk of those marketed are less than half these weights.

Agricultural Bureau of New South Wales.

NOTES COMPILED BY H. ROSS, Chief Inspector.

Branch.	Honorary Secretary.
Albury	Mr. J. Breun, "Silvania," Racecourse Road, Albury.
Baan Baa	Mr. P. Gilbert, Baan Baa.
Balldale	Mr. H. Elrington, Balldale.
Bathurst	Mr. J. McIntyre, Orton Park.
Batlow	Mr. A. C. Arnot, Batlow.
Beckom	Mr. S. Stinson, Beckom.
Blacktown	Mr. Robert H. Lalor, P.O., Seven Hills.
Borambil	Mr. H. A. D. Crossman, "Homewood," Quirindi.
Bungalong	Mr. G. H. Pereira, "Springdale," Cowra Road, *viâ* Cowra.
Canadian	Mr. C. Smith, Canadian Lead.
Cardiff	Mr. John Cockburn, Cardiff.
Carlingford	Mr. D. K. Otton, Carlingford.
Cattai	Mr. A. J. McDonald, Cattai, Pitt Town.
Collie	Mr. C. J. Rowcliff.
Coonabarabran	Dr. F. G. Failes, Coonabarabran.
Coradgery	Mr. J. Clatworthy, Beechmore, Millpose, Parkes.
Coraki	Mr. G. E. Ardill, Bungawalbyn.
Coreen-Burraja	Mr. N. B. Alston, Coreen, *viâ* Corowa.
Courangra	Mr. S. H. Warland, Courangra, *viâ* Brooklyn.
Cowra	Mr. E. P. Todhunter, Cowra.
Crudine	Mr. F. W. Clarke, Crudine.
Cundletown	Mr. S. A. Levick, Roseneath, Cundletown.
Cundumbul and Eurimbla	Mr. J. D. Berney, Eurimbla, *viâ* Cumnock.
Deniliquin	Mr. W. J. Adams, jun., Deniliquin.
Derrain	Mr. A. P. Hunter, Red Bank Creek, Matong.
Dubbo	Mr. T. A. Nicholas, Dubbo.
Dunedoo	Mr. V. A. Florance (*pro tem*), Dunedoo.
Erudgere	Mr. Frank Hughes, Erudgere.
Fairfield West	Mr. J. H. Spargo, Hamilton Road, Fairfield.
Fernbrook	Mr. W. Marks, Yarrum Creek, Dorrigo.
Forest Creek	Mr. W. Thompson, Forest Creek, Frogmore.
Garra and Pinecliff ...	Mr. A. S. Blackwood, "Netherton," Garra, *viâ* Pinecliff.
Gerringong	Mr. J. Miller, Gerringong.
Grenfell	Mr. G. Cousins, Grenfell.
Gunning	Mr. E. H. Turner, Gunning.
Henty	Mr. H. W. Smith, Henty.
Hillston	Mr. M. Knechtli, Hillston.
Inverell	Mr. W. A. Kook, Rock Mount, Inverell.
Jerrara	Mr. A. O. Lane, Public School, Mullengrove, Wheeo.
Jindabyne	Mr. Sylvester Kennedy, Jindabyne.
Katoomba	Mr. C. Wooller, Oliva Park Farm, Katoomba.
Keepit, Manilla	Mr. J. B. Fitzgerald, Keepit, *viâ* Manilla.
Kellyville	Mr. Joseph Nutter, Kellyville.
Kenthurst	Mr. J. R. Jones, Kenthurst.
Lankey's Creek (Jingellic)	Mr. G. J. Nichols, P.O., Jingellic.
Leech's Gully	Mr. Cecil G. Chick, Tenterfield.
Leeton	Mr. C. Ledwidge, Farm 442, Leeton.
Little Plain	Mr. F. S. Stening, Little Plain, *viâ* Inverell.
Lower Portland	Mr. W. C. Gambrill, Lower Portland.
Mangrove Mountain ...	Mr. G. T. Hunt, Mangrove Mountain, *viâ* Gosford.
Martin's Creek	Mr. P. Laney, Martin's Creek, *viâ* Paterson.
Meadow Flat	Mr. F. J. Brown, "The Poplars," Meadow Flat, *viâ* Rydal.
Middle Dural	Mr. A. E. Best, "Elliceleigh," Middle Dural.
Milbrulong	Mr. O. Ludwig, Milbrulong.
Miller's Forest	Mr. A. J. O'Brien, Miller's Forest.
Mittagong	Mr. W. S. Cooke, "Fernmount," P.O., Alpine.
Moruya	Mr. P. Flynn, Moruya.
Narellan	Mr. G. J. Richardson, Narellan.
Narrandera	Mr. C. F. Pearce, Narrandera.

Branch.	Honorary Secretary.
Nelson's Plains	Mr. M. Cunningham, Nelson's Plains
New Italy	Mr. F. A. Morandini, New Italy.
Nimbin	Mr. J. T. Hutchinson, Nimbin.
Orangeville	Mr. C. Duck, Orangeville, The Oaks
Orchard Hills (Penrith) ...	Mr. H. Basedow, Orchard Hills, *viâ* Penrith.
Parkesbourne	Mr. W. H. Weatherstone, Parkesbourne.
Peak Hill	Mr. A. B. Pettigrew, Peak Hill.
Penrose-Kareela	Mr. A. J. Bennett, "Brookvale," Kareela.
Ponto	Mr. A. D. Dunkley, Ponto.
Redbank	Mr. J. J. Cunningham, Redbank, Laggan.
Ringwood	Mr. Wm. Tait, Ringwood.
St. Mary's	Mr. W. Morris, Queen and Victoria Streets, St. Mary's.
Sackville	Mr. Arthur Manning, Sackville.
Sherwood	Mr. J. E. Davis, Sherwood.
Stockinbingal	Mr. J. Neville, Stockinbingal.
St. John's Park	Mr. J. C. Scott, St. John's Park.
Tallawang	Mr. G. Lincoln, junior, Tallawang.
Taralga	Mr. Dave Mullaney, Stonequarry, Taralga.
Tatham	Mr. J. J. Riley, Tatham.
Temora	Mr. J. T. Warren, "Mortlake," Victoria-street, Temora.
Toronto	Mr. J. G. Desreaux, Esmond, Toronto.
Tumbarumba	Mr. R. Livingstone, Tumbarumba.
United Peel River (Woolomin).	Mr. C. J. MacRae, Woolomin.
Upper Belmore River ..	Mr. A. W. Fowler, Upper Belmore River, *viâ* Gladstone, Macleay River.
Uralla	Mr. E. A. Neil, Uralla.
Valla	Mr. A. E. T. Reynolds, Valla, *viâ* Bowraville.
Wagga	Mr. Thos. Fraser, Aberfeldie, Wagga.
Walla Walla	Mr. H. Smith, Walla Walla.
Wallendbeen	Mr. W. J. Cartwright, Wallendbeen.
Walli	Mr. Geo. Edgerton, Applewood, Walli.
Wetherill Park	Mr. L. Rainbow, Wetherill Park.
Wollun	Mr. Robert Turner, Wollun.
Wolseley Park	Mr. H. McEachern, Wolseley Park.
Wyan	Mr. C. W. Harper, Myrtle Creek Railway Station.
Wyong	Mr. Edgar J. Johns, Wyong.
Yass	....
Yetholme	Mr. N. D. Graham, "Bona Dea," Yetholme.
Yurrunga and Avoca ...	Mr. W. H. Waters, Yurrunga.

Notice to Honorary Secretaries.

It is important that a record of the meetings of the branches should be inserted in the *Agricultural Gazette*, and honorary secretaries are invited to forward to the Department a short account of the proceedings of each meeting, with a brief summary of any paper which may have been read, and the discussion that followed it, as early as possible after each meeting. Notes for insertion in the *Agricultural Gazette* must reach the Department before the 16th to ensure insertion in the following month's issue.

Insect Pests.—Quite a number of the branches have availed themselves of the Department's offer to supply a set of insects, being the common pests of the district, and the collections are now being cased. The Government Entomologist suggests that as each district has certain pests peculiar to its orchards and gardens, more useful work would be done if the members themselves collected the local pests (orchard, garden, and stock) and sent them to the Department, where they would be arranged, mounted, a descriptive label attached, and returned to the branch. Mr. Froggatt considers that

such a collection would have a far greater value, as there would be more interest attached to the specimens when the members knew exactly where the pests came from, and where and how to find them.

Demonstrations in Clearing Land and Subsoiling with Explosives.

A limited number of demonstrations in clearing land and subsoiling with explosives will be given by Mr. C. W. Burrows, Assistant Inspector of Agriculture, to branches of the Agricultural Bureau. Branches who wish to take advantage of this offer are requested to make early application to the Department through their honorary secretaries.

Veterinary Lectures.

In connection with the lectures to branches of the Agricultural Bureau, it is herewith pointed out for the information of honorary secretaries that the following is the list of subjects of lectures which can be delivered to them :—

Horses.—(1) Conformation and Unsoundness (with lantern illustrations); (2) Colic and Treatment of Wounds; (3) Strangles, Influenza, and Tetanus.

Cattle.—(1) Tuberculosis (with lantern illustrations); (2) Contagious Abortion and Contagious Mammitis; (3) Ticks, Tick Fever, Tick Infestation and Eradication.

Sheep.—Parasitic Diseases of Sheep.

Pigs.—Diseases of Pigs.

General.—(1) Parturition of Farm Animals (with lantern illustrations); (2) Feeding of Farm Animals and Dietetic Diseases; (3) Sterility: Causes and Treatment in all classes of Stock.

Bee Keeping.

A series of lectures on bee-keeping is being arranged by Mr. R. G. Warry, Instructor in Apiculture. Secretaries, whose branches intend availing themselves of this opportunity to receive a practical insight into this branch of agriculture, are requested to make early application.

REPORTS AND NOTICES FROM BRANCHES.

Batlow.

The Secretary of this branch reports a visit from Mr. J. W. Mathews, Sheep and Wool Expert, on the 21st November, when he delivered a lecture before the members.

Sheep in a Cool District.

Mr. Mathews said he realised he was in a fruit-growing district, and he had not come to advise fruit-growers to give up what now appeared a lucrative pursuit and launch out wholly into sheep-breeding. The object of his mission was to show that sheep-raising, as in other districts, could be successfully undertaken in conjunction with other branches of agriculture. On many of their holdings they possessed land that was not entirely suitable for fruit-growing, and it would appear that there sheep-raising would prove a very profitable adjunct.

He strongly advocated the growing of fodder crops that could be profitably utilised by feeding off with sheep. The district seemed eminently suited to this particular branch of stock-raising. The soils were rich, and almost any class of crop could be grown to advantage. Haphazard methods, in allowing the sheep to pick up whatever they could in the form of unsuitable grasses grown on rank, sour pastures, were to be deprecated. To the man who would undertake sheep-raising in these localities two courses were open :—(1) The production of pure-bred flocks of the British breed. (2) A system of cross-breeding, with the object of raising early lambs suitable for export.

With regard to pure-bred flocks, he considered that the rich, fertile soils and heavy rainfall made the district eminently suited to the production of almost any of the British breeds, preferably Longwools, and more particularly Lincolns. This breed required a cool

climate, rich soils, and a sufficient supply of good, rich, succulent food. Turnips, rape, and other such crops, to say nothing of lucerne and red clover, could all be grown in the district, and these might be profitably fed to sheep. In the old country, a man owning a flock of 40 or 50 sheep was considered to be in a very fair way, and although in Australia such a flock would scarcely be worth consideration, yet a fair income might be derived from a flock of, say, 100 sheep.

Regarding crossbreds, he was strongly of opinion that they could be profitably carried under local conditions. In New Zealand there had been carried and fattened as many as ten ewes (rearing their lambs) to the acre. If only one-half of that number could be carried in the Batlow district, a fair increment should be forthcoming each year from the sheep, at little cost. Breeders were, therefore, advised to give crossbreds a trial, and to test the carrying capacity of the land. He pointed out that at the age of 5 months, lambs locally bred would bring anything up to 15s. each, and this, together with the value of the fleece of the ewe, should provide a very remunerative return.

For the raising of lambs, he advocated the crossbred ewe—the Lincoln-Merino for preference. Breeders should obtain good first cross ewes, and mate them with Dorset Horn, Shropshire, or South Down rams. It could not be stated definitely which of these rams would prove the best under local conditions, but he was emphatic in his belief in the crossbred ewe. Breeders should certainly not employ the Merino ewe for the raising of lambs under the conditions obtaining at Batlow. The climate there was too cold, and the tendency would be for the Merino to degenerate.

The lecture was illustrated by means of lantern views, and the merits of the various types of British breeds and the different Merino strains were individually discussed.

Blacktown.

The first monthly meeting was held on 5th January, the Vice-Chairman (Mr. Lalor) presiding. Three new members were elected. Subjects as follows were set down for discussion in the future:—(1) Water Conservation; (2) Underground Drainage; and (3) Veterinary Science. Mr. Lalor will read a paper at the February meeting, dealing with the first-named subject.

Mr. C. W. Burrows, Assistant Inspector of Agriculture, visited the district on 16th January, and gave a demonstration in uprooting stumps and subsoiling with explosives. Though the notice was very short, upwards of eighty persons, including Mr. T. R. Moxham, M.L.A., were present, and much interest was manifested, numerous questions being asked and satisfactorily answered. A start was made on a 3 feet box stump, which was reduced to firewood. The cost was stated to vary from 9d. to 5s. per stump, according to size and surrounding conditions.

Mr. Burrows also carried out some subsoiling, operating under one fruit-tree as well as between other trees.

On the motion of Messrs. McMahon and Sayer, a hearty vote of thanks was accorded Mr. Burrows, who, in responding, expressed the pleasure of the Department in being able to assist in the advance of agricultural education in Blacktown.

Coradgery.

A seed-wheat growing competition was conducted under the auspices of this branch during the past season, and the following is the text of the report of the judge, Mr. W. R. Birks, B.Sc., Inspector of Agriculture, together with the awards, which have been made available:—

Judge's Report on a Seed-wheat Growing Competition.

The results from the eleven plots for which yields were recorded are set out in the accompanying Table I, together with the allotment of points. The outstanding features

of the competition are the disappointing yields as compared with pre-harvest indications (in some cases the return was no more than two-thirds of the quantity the crop was expected to yield), and the low bushel weight. Both phenomena appear to be general throughout the district, and are accounted for by the very hot spell experienced at the end of October and early in November, which caused an unusually rapid ripening-off.

The samples, from a seed-wheat point of view, were fair to good. In one or two cases the grain was considerably pinched. In point of purity and cleanliness, however, the standard attained was very high, and in a number of the plots scarcely a fault could be found in those respects. It is noteworthy that four out of the five leading plots were grown from stud wheat, and all were planted on fallowed ground. The competition has thus demonstrated that most of the competitors are thoroughly seized of the importance of devoting special care to the choice and growing of their seed.

The preliminary judgment for purity and freedom from weeds and disease was carried out on 30th October, when the crops were ripening off, and resulted in the allotment of points as indicated in Table II. In arriving at this decision, the crops were regarded strictly as being intended for seed, and were judged accordingly. Thus, with regard to purity, every strange head of wheat found was regarded as being appreciably detrimental to the value of the seed. As mentioned above, the standard set was exceptionally good, for in some of the leading plots a diligent search revealed not a single "stranger." In other cases, however, the wheat was considerably mixed, thus emphasising the difficulty of keeping seed pure on the farm for more than a year or two without special treatment. One point worthy of mention in this connection was a crop of Hard Federation, in which heads with whitish chaff appeared freely amongst the ordinary red chaff heads. This was not regarded as an impure wheat, since at Cowra Experiment Farm, where this variety was developed, the whitish heads were at first not regarded as detrimental, (except in the stud plots) and for a year or two the new strain was distributed as pure. The irregularity has since been corrected, and as a strain of Hard Federation with uniform red chaff has now been established, an admixture of whitish heads could not be so easily overlooked in future competitions.

Again, in respect of "cleanliness," weeds such as black oats and drake, the seeds of which can be removed in the grader, were regarded as being of less importance than those of a weed such as ironweed, which is less easily got rid of. Also in diseases, those not likely to be transmitted in the seed (such as rust and flag smut) were not looked upon as being so serious as would have been the case with bunt.

As a matter of fact, the plots were exceptionally free from both disease and weeds. In two cases only were wild oats prevalent, and the only other weeds met with were odd plants of charlock, drake, and barley. In no instance was the presence of bunt detected, and in the three cases in which slight deductions were made under the heading of disease, it was for a few scattered plants affected with loose smut or flag smut.

TABLE I.—General Summary.

Competitor.	Variety of Wheat.	Points for Purity and Cleanliness.	Actual Yield.		Points for Yield.	Actual Bushel Weight.	Points for Bushel Weight.	Total Points.
			bus.	lb.		lb.		
A. Millgate	Hard Federation ..	24	16	30	49	61½	3	76
P. W. Lorimer ...	Federation ...	22	16	44	50	62	4	76
,, ...	Yandilla King ..	14	17	25	52	60	...	66
G. C. Harris... ...	Firbank	24	13	24	40	59¾	...	64
Bevan and Taylor ...	Yandilla King ..	24	11	35	34	62	4	62
Walter Brown ...	Federation ...	24	11	47	35	61	2	61
Wm. Brown	Rymer	14	14	29	43	61¼	2	59
T. J. Frecklington ...	Federation ..	24	10	14	30	62	4	58
G. C. Harris	Bunyip	24	10	26	31	60	...	55
Walter Brown ...	Yandilla King ...	15	12	0	36	60½	1	52
Bevan and Taylor .	Warren	23	6	43	20	63¼	0	49

TABLE II.—Judgment for Purity, &c.

Competitor.	Variety.	Purity (12).	Freedom from Disease (10).	Freedom from Weeds (3).	Total.
A. Millgate... ..	Hard Federation..	11·5	9·5 (flag smut).	3	24
G. C. Harris ...	Firbank	12	9 (loose smut).	3	24
„ ...	Bunyip	11·5	10	2·5 (odd oats).	24
Bevan and Taylor...	Yandilla King ...	11	10	3	24
„ ...	Warren	12	8 (flag and loose smut).	3	23
T. J. Frecklington...	Federation ..	11	10	3	24
Walter Brown ...	„ ..	11	10	3	24
„ ...	Yandilla King ..	2	10	3	15
P. W. Lorimer ...	Federation ...	11	10	1 (black oats).	22
„ ...	Yandilla King .	3	10	1 (black oats)	14
Wm. Brown ...	Rymer	1	10	3	14

Lankey's Creek (Jingellic).

At the invitation of the members of the Lankey's Creek (Jingellic) branch, Mr. J. W. Mathews, Sheep and Wool Expert, visited the district on 26th November. The expert toured the district during the day, and visited many of the farms where shearing was in progress, and availed himself of the opportunity to offer many useful hints as regards the preparation for market of small clips of wool.

ENHANCING PASTORAL PROFITS.

After spending the day in collecting observations regarding the suitability of the district for wool-growing, Mr. Mathews proceeded to Mr. McVeane's woolshed at Jingellic, where he delivered a lantern lecture to about twenty local sheep-breeders. The absolute necessity of controlling the rabbit pest, as one of the most important steps to complete success in the wool-growing industry, was pointed out—the rabbit being a great check on the pastures, picking out the best grasses first. As to ridding the land of this pest, Mr. Mathews said that there was only the one undeniable remedy—that was, first of all, to wire-net the boundary fence, so as to prevent the invasion of rabbits from outside runs, and then, if convenient, to subdivide with wire-netting, so as to confine the rabbits to small areas. It was far easier to keep them in check in a number of small areas than in one big one. A further advantage in netting subdivisions was, that it enabled the pastoralist to keep each flock separate. This was essential in a complete system of breeding, and saved a good deal of expense in labour.

The spelling of pastures was another very important factor in success. A paddock required a spell during the spring months, every third or fourth year, so as to enable the best grasses to seed, for it was quite evident that if a paddock was continuously stocked during the seeding period of the year, the stock would surely gratify their preferences for the best grasses, and the most nourishing ones had not the same chance of seeding as the inferior ones.

As regards the class of sheep most suited to local conditions, Mr. Mathews strongly favoured Merinos, and advocated the introduction of medium-wool, plain-bodied rams; as the local wool appeared to have a tendency to become too fine, owing to climatic conditions, the selection of a bolder-natured animal would be advisable. He placed constitution before all things, and urged breeders to be ever cautious in avoiding sires with inferior constitutions, as a weakness of that nature was almost sure to be transmitted to the majority of the progeny.

Quoting the results of many of the Department's experiments in cross-breeding, he conveyed many valuable hints. At the conclusion of the meeting several questions were asked regarding sheep management.

A hearty vote of thanks was accorded Mr. Mathews for his instructive lecture, and all present expressed the desire that he would visit their district again in the near future, when it was hoped that the seasonal conditions would be more propitious.

Penrose-Kareela.

The monthly meeting of the above branch was held at Kareela on 9th January.

The yearly balance-sheet was submitted and received, and it was decided to allow members' subscriptions for the ensuing year to remain at 2s. 6d.

Mr. V. James and other orchardists gave some interesting accounts of their success in poisoning flying-foxes, which have been causing a lot of damage to the fruit crops in this district, and it was agreed that those who were troubled with this pest would find poisoning with strychnine a most effective method.

The procedure followed by orchardists in this district is as follows:—Take some of the most attractive fruit, and with a sharp pen-knife remove two or three plugs, cutting deep into the flesh. After inserting as much strychnine in each hole as would be picked up on a small pen-knife point, replace the plugs neatly. String the fruit on fine wire, and hang on a bush or pole suspended over the top of those trees that are attacked by the pest.

Taralga.

The monthly meeting was held on 4th January, when the returns of Mr. Howard's wheaten hay plots were discussed.

A demonstration of the use of explosives in agriculture was given by Mr. C. W. Burrows, Assistant Inspector, on 11th January, when two large dead gum-trees were selected for the purpose. Mr. Burrows carefully explained the whole procedure, and while emphasising the necessity for care in handling the explosives, indicated that they might be used with safety. Both trees were blown out completely and the butts shattered. The cost of removal was given as 3s. per tree, whereas the estimated cost of the work by hand was 20s. per tree. Farmers were very favourably impressed, and they decided to buy a turnout for use locally. A subsoiling demonstration was also given, but Mr. Burrows explained that this was never likely to be of much use in the deep red soil that predominates here.

Toronto.

At a meeting held on 5th December, Mr. Cockburn gave a lecture on the culture of the grape-vine on the coast. He said that diseases were more prevalent on the coast than inland, oïdium and black spot being particularly common and having to be contended with each year.

Yarrunga and Avoca.

The monthly meeting of this branch was held on 19th December. Future meetings were fixed to be held on the second Saturday in each month.

The feature of the evening was an address by Mr. W. H. Waters on "Fruit-tree Pests and Diseases and the Necessary Treatments," in which he dealt with all the pests and diseases that give trouble locally.

FRUIT-TREE PESTS AND DISEASES.

A brief life-history of each of the insect pests was given, and the different feeding habits explained, and it was thus shown why some insects were best destroyed by using an internal poison spray, while others could only be destroyed by contact sprays that were of an irritant nature or that clogged the respiratory organs by reason of their sticky character Fungoid diseases were also dealt with, and as these were more prevalent this season, in consequence of excessive rains, this phase of the question proved most interesting.

Formulæ were given for the two best-known fungicides, viz., lime-sulphur and Bordeaux mixture, and the uses of the former as a combined fungicide and scalecide were commented on. The combination of fungicides with arsenate of lead for combating black spot while spraying for codlin moth were explained.

In all cases the proper periods for application of each treatment were given, together with the reasons.

The address was greatly appreciated by the members. A hearty vote of thanks was accorded Mr. Waters.

The meeting for the month of January was held at Mr. G. Kagg's residence, Avoca, on the 9th.

A general discussion took place on the use of explosives in agriculture, fertilisers, and co-operative marketing of produce.

The members expressed appreciation of the batch of bulletins supplied by the Department for the use of the branch.

Yetholme.

A new branch of the Agricultural Bureau has been formed at Yetholme, with thirty members to commence. The following gentlemen have been elected office-bearers:—Chairman, Mr. F. J. McDonald; Vice-Chairman, Mr. John Maccabee; Hon. Secretary and Treasurer, Mr. Norman D. Graham.

Monthly meetings will be held on the Saturday evening nearest full moon.

The Secretary states that during recent years Yetholme has made an effort to come into line as a fruit-growing centre, and its high altitude, fine soil, and good rainfall particularly favour the cultivation of small fruits, as well as apples, pears, plums, and cherries. The larger orchards range from 100 acres down, and because of their success, almost every farmer in the district has planted out small areas.

Orchard Notes.

FEBRUARY.

W. J. ALLEN.

Cultivation.

NOTWITHSTANDING the good rains that have fallen during the early summer months, cultivation should not be neglected. Weeds should be kept down, and the land maintained in a state of tilth. Citrus trees especially require constant cultivation.

Irrigation.

Where irrigation is practised, see that the trees and vines are given a good watering if they require it. In most cases during normal seasons vines should not need any further watering, as in the case of raisin grapes it would retard the ripening period, which is precisely what we wish to hasten. On the other hand, it may help dessert varieties intended for marketing late in the fall or early winter. It should be borne in mind that where trees or vines are watered, the land should be thoroughly cultivated immediately it is dry enough to work.

Harvesting Fruits.

Handling and harvesting of fruits will still be continued. Fruit intended for export will be ready for picking towards the end of this month. For export, only the best quality fruit should be forwarded. It should be well coloured, of good size, evenly graded, neatly wrapped and firmly packed. The fruit should be picked in the cool part of the day, and handled carefully to avoid bruising.

Zante currants may be picked and dried this month; also pears, such as Williams, Le Conte, &c. Almonds, prunes, peaches, grapes, &c., should be harvested. All surplus fruits should either be dried, canned, or converted into jam.

Drying of Fruit.

This operation will be in full swing this month. The Department issues a bulletin detailing the various operations. The raisin grape, sultana, and prune, all require to be dipped as soon as possible after picking, and before they have been placed on the trays to dry.

Fruit Fly.

All fly-infested fruit should be picked up and burnt. Kerosene traps placed on the sunny side of the trees are a splendid means of catching the adult flies.

Codlin Moth.

A careful look-out for codlin moth should still be kept. Bandages placed around the stems at the present time will act as a source of harbour for the

grubs, and will pay for the trouble of putting on so long as they are regularly inspected and the larvæ destroyed. All infected fruit should also be carefully destroyed.

Scale Insects.

The various scales, including white louse, should be treated either by fumigation or sprayed with special resin and soda wash or red oil emulsion: the last named when thoroughly emulsified gives good results. Leaflets on the formulas used may be had free upon application to the Department. The work should not be carried out in the hot part of the day, or upon trees in weak condition.

Citrus trees sprayed with lime-sulphur solution for black spot and other fungus diseases, will be benefited at this season. This spray is an insecticide as well as a fungicide, and is very useful in destroying white louse on the butts of citrus trees.

Reworking trees.

The present month is a most suitable time for reworking unprofitable and unsuitable varieties of fruit trees. The work should be conducted in the cool part of the day, so that the buds will not dry out. Buds should be selected from trees of proved bearing qualities. The sap needs to be full in order that the bark may lift readily.

Green Manuring.

Towards the end of the month arrangements should be made for sowing crops for green manuring, and as the fall and winter are the only seasons when such crops can be grown among the trees without robbing them of moisture, it is best to sow only such varieties as will make a fair growth during the cooler months. Field peas, vetches, Skinless barley, rape, and black winter are all suitable crops for the purpose of green manuring. Such crops as grey field peas and vetches are depended on to furnish nitrogen and organic matter to keep the soil in a high state of fertility.

Manuring.

The present month is a good time to manure citrus trees on the coast with artificial fertiliser.

Apiary Notes.

February.

R. G. WARRY, Demonstrator in Apiculture.

In several parts of the State, especially in the coastal districts, the White Apple (*Angophora subvelutina*) has been in bloom, and in some localities it is still flowering. The yield of nectar from this tree is abundant, but the quality and colour of the honey is poor. Many people consider White Apple

honey quite uneatable, and unless other better varieties are scarce in Sussex-street it is difficult to dispose of it, even at a penny a pound. Occasionally it has paid to consign it to Sydney, but a better plan is to store the crop of White Apple honey for use as bee feed the following spring. Wherever this plan is followed, however, none but honey from healthy colonies should be used for feeding back to bees.

Red Bloodwood (*Eucalyptus corymbosa*), flowering every second year, is due to flower during this month in some localities. The honey from this tree is some of the finest produced in New South Wales. It granulates quickly after extracting, but if liquefied after candying once, and then allowed to clear itself of scum and foreign matter, it will remain liquid quite long enough to be disposed of. Red Bloodwood honey obtains a good price, and is one of the best honeys for advertising and building up a business in candied honey.

The different conditions in which consignments of honey reach Sussex-street are remarkable. When a poor price is obtained the railway authorities are blamed by the bee-farmer, but a good deal of improvement could be effected in some consignments before they leave the apiary. Some tins of choice box honey are difficult to sell on account of the careless way the honey has been treated before tinning, whilst other tins of honey, perhaps inferior to box, from other apiaries are readily disposed of because the honey has been thoroughly skimmed before tinning. There is everything to gain in heating and skimming before packing honey that is intended for the Sydney market.

The tins used, whether new tins or empty petrol tins, should be cleansed before filling. Screw caps on the petrol tins are preferred by agents, as they allow any tin in a batch to be easily opened and sampled, and then closed again. Some fairly large consignments of honey are to be met with in Sussex-street, put up in kerosene tins which are certainly not clean outside. These purchasers often return, claiming that they are not clean inside; no form of screw cap is used for filling and emptying, the tins having been simply filled with honey through the hole that the kerosene was drawn from, and the hole stopped with a flat piece of tin soldered on. Purchasers are never keen on honey packed in this way, and the general get-up of the batch of tins is often far from inviting.

In apiaries where quantities of old combs have been renewed, there will be an accumulation of broken comb if there has been no time to render it into cakes of wax. This mass of comb will need attention, as the wax moth soon gets to work on it and destroys it. If the moth is found in the comb, a good plan is to melt the mass in plenty of water, and allow it to cool. A dirty cake of wax and cocoons is then formed which can be taken out of the water, and dried and wrapped in brown paper with a little crushed moth ball, and put away until there is time to render it into clean cakes of wax with the wax press.

Government Stud Bulls available for service at State Farms, or for lease.

Breed.	Name of Bull.	Sire.	Dam.	Stationed at—	Engaged up till—
Shorthorn ...	Melba's Emblem (183 M.S.H.B.)	Emblem of Darbalara (100 M.S.H.B.)	Melba 3rd of Darbalara (1058 M.S.H.B.)	Berry Farm ...	‖
" ...	Imperialist ...	Florio	Lady Nancy of Minembah.	Berry Farm ...	*
" ...	The Irishman (imp.)	Tipperary Bull	Colleen Bawn (imp.)	Robertson ...	17 Mar., '15
Jersey ...	Grenadin (imp.)	Attorney (9477)	Cyril's Carnation (imp.).	Yanco Farm ...	*
" ...	Trafalgar ...	Best Man ...	Rum Omelette	Cowra Farm ...	*
" ...	Kaid of Khartoum	Sir Jack ...	Egyptian Belle	H. A. College ...	*
" ...	Leda's Retford Pride.	Dinah's Lad ...	Leda's Angel..	Wagga Farm ...	‖
Guernsey ...	The King's Mirror	Calm Prince ...	Vivid (imp.)...	South Kyogle ...	15 Feb., '15.
" ...	Star Prince ...	Calm Prince ...	Vivid (imp.)...	Casino	23 April, '15.
" ...	Godolphin Moses (imp.)	Golden Hero of the Vauxbelets (1929)	Rosetta (6509)	Inverell	6 April, '15.
" ...	Hayes' Fido (imp.).	Hayes' Coronation 3rd.	Hayes' Fi-Fi 2nd.	Wollongbar Farm	‖
" ...	Claudius (imp.)	Golden Star II..	Claudia's Pride (imp.).	Murwillumbah ...	30 June, '15.
" ...	George III ...	King of the Roses	Calm 2nd ...	Wollongbar Farm	‖
" ...	The Peacemaker	Calm Prince ...	Rose Petersen	Wollongbar Farm	*
" ...	King of the Roses	Hayes' King ...	Rosey 8th (imp.).	South Kyogle ...	30 July, '15.
" ...	Lauderlad ...	Laura's Boy ...	Souvenir of Wollongbar	Mullumbimby ...	6 April, '15.
" ...	Belfast	King of the Roses	Flaxy 2nd ...	Tyalgum	28 May, '15.
" ...	Royal Preel ...	Itchen Royal ...	Hayes' Lily du Preel (imp.).	Tyalgum	30 Jan., '15.
" ...	Alexander the Great.	Claudius (imp.)	Alexandrina of Richmond.	Frederickton ...	25 Mar. '15.
Ayrshire ...	Dan of the Roses	Daniel of Auchenbrain (imp.).	Ripple Rose...	Grafton Farm ...	*
" ...	Wyllieland Bright Lad (imp.)	Wyllieland Gleniffer (7229)	Wyllieland Sangie	Glen Innes Farm..	*
" ...	Isabel's Majestic	Majestic of Oakbank.	Isabel of Gleneira.	Grafton Farm ...	‖
Kerry... ...	Rising Sun ...	Bratha's Boy ...	Dawn ...	Bathurst Farm ...	*

*Available for service only at the Farm where stationed. † Available for lease or for service at the Farm where stationed
‖ Available for special service where stationed upon application to the Under Secretary.

Department of Agriculture,
Sydney, 2nd February, 1915.

BULLS FOR SALE

AT BERRY EXPERIMENT FARM.

If not applied for by 15th February, 1915, these bulls will be reserved for sale at the Sydney Show.

IRISH SHORTHORN.—**Irish Boy** (577): Passed for Vol. IV of M.S.H.B. Date of birth, 9th April, 1912; colour, rich roan; sire, Limerick's Lad (imp.); dam, Colleen Bawn (imp.). Price, **40 guineas.**

Milk yield of dam :—	Milk lb.	Fat per cent.	Butter lb.
Colleen Bawn...	6,937	3·8	309

GUERNSEYS.—**Mountain Prince** (593): date of birth, 12th January, 1913; colour, lemon and white; sire, Calm Prince; dam, Angelica 8th (imp.). Price, **30 guineas.**

Rohais' Lad (601): date of birth, 18th March, 1913; colour, lemon and white; sire, Calm Prince; dam, Rohais' Lassie (imp.). Price, **40 guineas.**

Milk yield of dam :—	Milk lb.	Fat per cent.	Butter lb.
Rohais' Lassie	5,537	5·1	333

Othello (605): date of birth, 4th April, 1913; colour, lemon and white; sire, Trengwainton Village Favourite (imp.); dam, Desdemona 8th (imp.). Price, **35 guineas.**

Milk yield of dam :—	Milk lb.	Fat per cent.	Butter lb.
Desdemona 8th (imp.)	6,721	4·3	340

Four-leaf Shamrock (584): date of birth, 26th November, 1912; colour, lemon and white; sire, Calm Prince; by Rose Prince (imp.); dam, Shamrock of Les Vesquesses (imp.) (5394), by Royal Blood 5th (1111). Price, **30 guineas.**

	Milk lb.	Fat test per cent.	Butter lb.
Milk yield of dam	4,941	4·9	285

King of the Preel (592): date of birth, 31st November, 1912; colour, lemon and white; sire, Trengwainton Village Favourite (imp.) (2102); dam, Flower of the Preel 3rd (imp.) (209). Price, **30 guineas.**

	Milk lb.	Fat test per cent.	Butter lb.
Milk yield of dam	6,137	4·6	332

JERSEY.—**Bridegroom** (515): date of birth, 25th October, 1911; colour, whole fawn; sire, Best Man, 220 A.J.H.B., recently sold for £150; dam, Golden Omelette, 438 A.J.H.B.; by Sir Jack, 188 A.J.H.B.; from Rum Omelette 2nd, 699 A.J.H.B.; by Golden Lord (imp.), 39 A.J.H.B.; from Rum Omelette (imp.), 210 A.J.H.B. Price, **20 guineas.**

Best Man, 220 A.J.H.B., is by Melbourne (imp.), 56 A.J.H.B.; from Lady Tidy 3rd (imp.), 128 A.J.H.B.

Milk yield :—	Milk lb.	Test.	Butter lb.
Dam, Golden Omelette	3,064	5·6	202 (in 28 weeks).
G dam, Rum Omelette 2nd ...	5,109	4·8	289
G g dam, Rum Omelette	6,077	—	332
Lady Tidy 3rd (imp.)	5,678	5	333

BULLS FOR SALE—*continued.*

HOLSTEINS.—Captain Muller (No. 609), calved 16th May, 1913; colour, black and white; sire, Powerful of Brundee, by Edinglassie (imp.); dam, Miss Muller, by Hollander, by Bosch 3rd (imp.); g d, Margosa, by Garfield (imp.); g g d, Maggie Obbe, by Obbe (imp.); g g g dam, Margaretha (imp.) Price, **15 guineas.**

Milk yields :—	Milk lb.	Test per cent.	Butter lb.
Miss Muller (first calf)	7,262	3·4	288
Margosa	6,349	3·2	237
Maggie Obbe	7,699	—	272
Margaretha (imp.)	10,990	—	407

No. 625 (unnamed), calved 19th September, 1913; colour, black and white; sire, Cavalier, by De Wet, from Fraulien Arama; dam, Lolkje Amster, by Amsterdam; g dam, Lolkje, by Joubert, from Lolkje Veeman (imp.); Amsterdam was by Garfield (imp.), from Lady Margaret, by Obbe (imp.), from Schot 5th (imp.). Price, **20 guineas.**

Milk yields :—	Milk lb.	Test per cent.	Butter lb.
Lolkje Amster (295 days)	6,012	—	259
Lolkje (first calf)	5,828	3·5	234
Lady Margaret (first calf)	6,000	—	277

GEORGE VALDER, Under Secretary, and
Director of Agriculture.

AGRICULTURAL SOCIETIES' SHOWS.

SECRETARIES are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 21st of the month previous to issue. Alteration of dates should be notified at once.

1915.

Society.	Secretary.	Date.
Berry A. Association	S. G. Banfield	Feb. 4, 5
Wyong A. Association	C. R. Seabrook	" 5, 6, 7
Moruya A. and P. Society	H. P. Jeffery	" 10, 11
Shoalhaven A. and H. Association (Nowra)	H. Rauch	" 10, 11
Kangaroo Valley A. and H. Association	J. J. Moffitt	" 18, 19
Central Cumberland A. and H. Association (Dural)	H. A. Best	" 19, 20
Dapto A. and H. Society	J. H. Lindsay	" 23, 24
Guyra P., A., and H. Association	P. N. Stevenson	" 23, 24, 25
Alstonville A. Society	C. D. McIntyre	" 24, 25
Campbelltown A. Society	F. Sheather	" 24, 25
Manning River A. and H. Society (Taree)	L. Plummer	" 24, 25
Gunning P., A., and I. Society	J. R. Turner	" 24, 25
Robertson A. and H. Society	Ross Graham	" 24, 25
Ulladulla A. and H. Association	Jno. Boag	" 24, 25
Tumut A. and P. Association	T. E. Wilkinson	Mar. 2, 3
Uralla A. Association	H. W. Vincent	" 2, 3, 4
Tenterfield P., A., and M. Society	F. W. Hoskin	" 2, 3, 4
Bega A., P., and H. Society	H. J. B. Grime	" 3, 4
Braidwood P., A., and H. Association	L. Chapman	" 3, 4

AGRICULTURAL SOCIETIES' SHOWS—*continued.*

1915.

Society.	Secretary.	Date.
Gloucester A., H., and P. Association	G. E. Furness	Mar. 3, 4
Camden A., H., and I. Society	A. Thompson	„ 3, 4, 5
Newcastle A., H., and I. Association	E. J. Dann	„ 3, 4, 5, 6
Berrima District A., H., and I. Society (Moss Vale)	C. E. Wynne	„ 4, 5, 6
Blayney A. and P. Association	H. R. Woolley	„ 9, 10
Glen Innes & Central New England P. & A. Assoc'n	G. A. Priest	„ 9, 10, 11
Coramba District P., A., and H. Society	H. E. Hindmarsh	„ 10, 11
Tumbarumba and Upper Murray P. and A. Society	E. W. Figures	„ 10, 11, 12
Nepean District A., H., and I. Society (Penrith)	P. J. Smith	„ 11, 12
Taralga A., P., and H. Association	G. Goodhew	„ 11, 12
Wauchope P., A., and H. Society	A. D. Suters	„ 11, 12
Mudgee A., P., H., and I. Association	P. J. Griffin	„ 16, 17, 18
Cobargo A., P., and H. Society	T. Kennelly	„ 17, 18
Inverell P. and A. Association	J. McIlveen	„ 17, 18, 19
Wallamba District A. and H. Association (Nabiac)	T. R. Dun	„ 18, 19
Goulburn A., P., and H. Society	G. G. Harris	„ 18, 19, 20
Quirindi P., A., and H. Association	H. H. Rourke	„ 23, 24
Batlow A. Society	C. S. Gregory	„ 23, 24
Luddenham A. and H. Society (Wallacia)	F. S. Leggo	„ 23, 24
Molong P. and A. Association	W. J. Windred	„ 24
Warialda P. and A. Association	C. O'C. Murray	„ 23, 24, 25
Bangalow A. and I. Society	W. H. Reading	„ 23, 24, 25
Cooma P. and A. Association	C. J. Walmsley	„ 24, 25
Macleay A., H., and I. Association (Kempsey)	E. Weeks	„ 24, 25, 26
Upper Hunter P. and A. Association (Muswellbrook)	R. C. Sawkins	„ 24, 25, 26
Dorrigo A., H., and I. Society	W. R. Colwell	„ 24, 25
Coonabarabran P. and A. Association	G. B. McEwen	„ 24, 25
Crookwell A., P., and H. Society	J. H. Huxley	„ 25, 26
Royal Agricultural Society of N.S.W.	H. M. Somer	Mar. 30 to Apl. 7
Eastern Dorrigo District A., H., and I. Society (Ulong)	T. B. Timms	April 5
Adaminaby P. and A. Association	W. Delany	„ 7, 8
Hunter River A. and H. Association (West Maitland)	E. H. Fountain	„ 14, 15, 16, 17
Tamworth P. and A. Association	J. R. Wood	„ 20, 21
Richmond River A., H., and P. Society (Casino)	D. S. Rayner	„ 21, 22
Orange A. and P. Association	W. J. I. Nancarrow	„ 21, 22, 23
Dungog A. and H. Association	C. E. Prout	„ 28, 29
Nyngan P. and A. Association	E. W. Costelloe	„ 28, 29
Clarence P. and A. Society (Grafton)	G. N. Small	May 5, 6, 7
Hawkesbury District A. Association (Richmond)	H. Johnston	„ 6, 7, 8
Lower Clarence A. Society (Maclean)	J. McPherson	„ 11, 12
Peak Hill P., A., and H. Association	A. Yeo	July 28, 29
National A. and I. Assn. of Queensland (Brisbane)	J. Bain	Aug. 9–14
Narandera P. and A. Association	H. S. Robinson	„ 10, 11
Gunnedah P., A., and H. Association	M. C. Tweedie	„ 24, 25, 26
Murrumbidgee P. and A. Association (Wagga)	A. F. D. White	„ 24, 25, 26
Parkes P., A., and H. Association	G. W. Seaborn	„ 25, 26
Cowra P., A., and H. Association	E. W. Warren	Sept. 14, 15
Temora P., A., H., and I. Association	A. D. Ness	„ 21, 22, 23
Northern A. Association (Singleton)	J. McLachlan	„ 22, 23, 24
Yass P. and A. Association	E. A. Hickey	„ 29, 30

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Agricultural Gazette of New South Wales.

Farmers' Experiment Plots.

WHEAT HARVEST, 1914–15.

NORTH-WESTERN DISTRICT.

F. DITZELL, Assistant Inspector.

FOURTEEN wheat experiment plots were conducted throughout the North-western wheat districts. The areas cultivated for the purpose ranged from 7 to 15 acres, divided into individual plots of either $\frac{5}{8}$, 1, or 5 acres. Thirteen were grain trials embracing cultivation, variety, seeding, and manurial tests, while one was a hay trial embracing cultivation, variety, and seeding tests.

The following are the names and addresses of the farmers who co-operated with the Department in the carrying out of these experiments:—

Mr. J. Perry, "Killara," Quirindi.
Mr. S. Forge, "Oxley," Tamworth.
Messrs. Bignall Bros., "Arlington," Manilla.
Mr. E. Currell, "Herbert Vale," Long Arm Road, Barraba.
Mr. E. F. Young, "Carrara," Curlewis.
Mr. J. H. McDonald, "Toryburn," Gunnedah.
Mr. R. A. Studd, "Glenaire," Boggabri.
Mr. W. T. Penrose, "Retreat," Wean, Boggabri.
Mr. F. Jordan, "Pine Vale," Boggabri.
Mr. W. Palmer, "Pine View," Narrabri.
Mr. E. J. H. Goodsell, "River View," Pallamallawa.
Mr. J. R. Coulton, "Avondale," Gravesend.
Mr. W. Tonkin, "Garfield," Delungra.
Messrs. Kook Bros., "Rock Mount," Inverell.

Cultural Notes.

The scanty-stooling varieties of wheat—Bunyip, Florence, Firbank, and Huguenot—were generally seeded about 5 lb. per acre heavier than the quantities given below.

Quirindi.—Soil, friable and deep red alluvial, without a clay subsoil; previous crop, wheat; summer fallowed; ploughed February, 1914; cultivated five times with spring-tooth cultivator; the unfallowed plot was ploughed in May, and cultivated twice with spring-tooth cultivator; seed drilled at rate of 55 lb. per acre on 10th and 11th June; failure.

Tamworth.—Soil, red clay loam; long fallowed; ploughed August, 1913; skim-ploughed February, 1914; harrowed March; cultivated with scarifier-cultivator April; harrowed May; seed drilled at rate of 50 lb. per acre on 20th May; harvested 7th and 14th November.

Manilla.—Soil, red clay loam; previous crop, maize; summer fallowed; disc-cultivated February, 1914; harrowed March; disc-cultivated April; harrowed and spring-tooth cultivated May; seed drilled at rate of 50 lb. per acre on 21st May; harvested 18th November.

Barraba.—Soil, greyish clay loam; previous crop, wheat; summer fallowed; ploughed January, 1914; disc-harrowed March; re-ploughed May; seed drilled at rate of 45 lb. per acre on 26th May; harvested 21st and 25th November.

Curlewis.—Soil, red clay loam; one plot long fallowed; ploughed October, 1913; disc-cultivated January, March, and April, 1914; another plot summer fallowed; ploughed February, 1914; disc-cultivated March and April; another plot was not fallowed; ploughed end of March; disc-cultivated April; seed drilled at rate of 45 lb. per acre on 27th and 28th April; lightly fed off by sheep 14th June; failure.

Gunnedah.—Soil, greyish sandy loam; previous crop, wheat; summer fallowed; ploughed December, 1913; harrowed March, 1914; cultivated with spring-tooth cultivator April; seed drilled at rate of 45 lb. per acre on 2nd May; harvested 30th and 31st October and 16th November.

R. A. Studd, Boggabri.—Soil, friable rich red loam; previous crop, wheat; summer fallowed; spring-tooth cultivated December, 1913; ploughed January, 1914; spring-tooth cultivated March; disc-cultivated April; spring-tooth cultivated May; seed drilled at rate of 50 lb. per acre on 16th May; fed off on 2nd July; harvested on 31st October and 1st and 6th November.

W. T. Penrose, Boggabri.—Soil, friable, red, sandy loam, without a clay subsoil; long fallowed; ploughed August, 1913; disc-cultivated January, 1914; cultivated three times with spring-tooth cultivator; harrowed before drilling; seed drilled at rate of 45 lb. per acre on 14th May; harvested 21st October.

F. Jordan, Boggabri.—Soil, friable, reddish, sandy loam; previous crop, wheat; summer fallowed; ploughed February, 1914; disc-cultivated March; harrowed twice; seed drilled at rate of 45 lb. per acre on 15th and 16th May; lightly fed off with horses in June; harvested on 13th and 16th November.

Narrabri.—Soil, friable sandy loam; previous crop, wheat; summer fallowed; disc-cultivated February, 1914, and again in March and April; seed drilled at rate of 50 lb. per acre on 5th and 6th May, for all varieties except Florence and Bunyip, which were drilled in on the 9th June on land which had received an additional disc cultivation; 70 lb. of superphosphate was applied per acre; harvested 26th and 29th October and 5th November.

Pallamallawa.—Soil, friable rich red loam; previous crop, wheat; short summer fallowed; ploughed March; harrowed twice; spring-tooth cultivated April; the unfallowed plot was ploughed in April, and harrowed; seed drilled at rate of 45 lb. per acre on 28th and 29th April, for all varieties except Bunyip, which was drilled at the rate of 50 lb. per acre on the 1st June; fed off 10th July, to check ravages of rust; harvested 7th November.

Gravesend.—Soil, red clay loam which sets very readily; previous crop, wheat; summer fallowed; ploughed February, 1914; re-ploughed May; the unfallowed plot was ploughed end of March and re-ploughed in May; seed drilled at rate of 50 lb. per acre on 5th and 6th June; harvested 17th November.

Delungra.—Soil, rich chocolate loam; previous crop, wheat; summer fallowed; ploughed February, 1914; re-ploughed May and harrowed; seed drilled at rate of 45 lb. per acre on 4th June; harrowed after drilling; harvested 21st November and 3rd December.

Inverell.—Soil, fairly rich dark loam; previous crop, wheat; summer fallowed; ploughed February, 1914; spring-tooth cultivated three times; the unfallowed plot was ploughed end of May and spring-tooth cultivated twice; seed sown at the rate of 45 lb. per acre on 27th May with spring-tooth cultivator; harrowed after sowing; cut for hay 6th November.

The Season.

The 1914 season was a very unfavourable one for the north-western wheat districts generally, the Manilla, Tamworth, Gunnedah, Boggabri, Narrabri and surrounding districts returning low average yields. At Manilla the crops were practically a total failure, but between Boggabri and Narrabri they were a little better than elsewhere. In certain spots in each district where a few storms were received in the spring, better returns were obtained, but these areas were not very large. The one bright spot was along the Moree-Inverell railway line where good yields were obtained at Pallamallawa, Gravesend, Warialda, Delungra, and Inverell.

TABLE I.—Showing Rainfalls previous to Growing Period, North-western District, 1914.

	January.	February.	March.	April.	May.	Total.
	Points.	Points.	Points.	Points.	Points.	Points.
Quirindi	...	226	391	142	157	916
Tamworth	313	134	255	89	98	889
Manilla	...	...	259	151	130	540
Barraba	...	303	382	82	271	1,038
Curlewis	195	317	336	116	...	964
Gunnedah	108	181	297	121	...	707
R. A. Studd, Boggabri	70	188	294	130	159	841
W. T. Penrose, Boggabri ...	42	140	231	112	155	680
F. Jordan, Boggabri	...	188	294	130	159	771
Narrabri	...	255	715	137	...	1,107
Pallamallawa	...	...	778	218	...	996
Gravesend	...	324	532	258	322	1,436
Delungra	...	344	512	81	208	1,145
Inverell	...	344	512	81	208	1,145

The season for the first group of districts mentioned may be summarised by stating that the rainfall was rather below the average in January, but fairly good in February and March, while again below the average in April, May and June, so that generally the subsoil did not become thoroughly saturated, even on fallowed land. The sowing season was a favourable one, however, and all crops germinated well, and made a good growth, a fair amount of feeding off being practised. Where crops were sown very late, poor germinations sometimes resulted, because only small falls of rain were received in July. August, September, and the early part of October, were uniformly dry, and, therefore, many crops proved complete failures, while most of the others were destined to give light yields whether rain was received later or not. Fair rains were experienced during the latter half of October, but were usually too late to be of any substantial benefit. The late October and November rains in some cases were accompanied by storms which knocked the crops about considerably.

In the second group of districts mentioned above, considerably heavier falls of rain were received prior to sowing, so that the subsoil became saturated with moisture, with the natural result that, although only light falls of rain were received in July, and practically no rain in August, September, and early October, as in the other districts, yet good returns, in many cases up to 30 and 40 bushels per acre, were obtained. In the later districts of Delungra and Inverell, the late rains in October and November were of benefit to the crops. Many of the heavy crops in these districts were greatly damaged by storms in November, especially those on the river land at Pallamallawa and the black soil at Inverell.

TABLE II.—Showing Rainfalls during Growing Period, North-western District, 1914.

	May.	June.	July.	August.	Sept.	Oct.	Nov.	Total.
	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.
Quirindi	...	127	145	...	30	...	...	302
Tamworth	47	93	107	...	11	154	74	486
Manilla	18	78	79	...	...	261	95	531
Barraba	...	101	92	...	19	176	183	571
Curlewis	134	30	90	...	55	...	...	309
Gunnedah	198	27	113	...	37	140	...	515
R. A. Studd, Boggabri	76	43	120	...	12	147	...	398
W. T. Penrose, Boggabri ...	35	77	114	...	26	...	...	252
F. Jordan, Boggabri	76	43	120	...	12	147	...	398
Narrabri	358	90	105	3	16	200	...	772
Pallamallawa	646	26	121	6	...	291	...	1,090
Gravesend	...	56	182	15	10	255	39	557
Delungra	...	91	144	44	54	231	172	736
Inverell	...	217	116	9	24	259	...	625

Table I shows the rainfall recorded in each district from the 1st January, 1914, if the land was then ploughed, or from the date the land was ploughed, until sowing time. The unfallowed plots at Quirindi, Curlewis, Pallamallawa, Gravesend, and Inverell were all ploughed later than their accompanying summer-fallowed plots, as indicated under "Cultural Notes," and therefore received smaller quantities of rain or none at all before planting, except at Pallamallawa, which is referred to under "Cultivation Tests." The late-sown crops of Florence and Bunyip at Narrabri received an additional 358 points of rain before sowing, and the late-sown plot of Bunyip at Pallamallawa an additional 646 points.

A perusal of Table II will show the rainfall received during the growth of the plots, but it must be pointed out that the total rainfall between sowing and harvesting is shown, which is in every instance in excess of the effective rainfall or rain of actual benefit to the plots. The rains received just prior to harvesting did not increase the yields, and in many instances were a decided disadvantage in knocking the crops about.

The plots were sown in May and early June, and good germinations were obtained in all cases except at Gravesend and Delungra. In these cases the soil was of a clayey nature, which the heavy rains preceding planting caused to set hard, so that when the land was re-worked just prior to sowing it turned up lumpy and rapidly dried out. A good rain was therefore necessary to ensure a good germination, but only light showers were received, with the result that in each case the germination was patchy.

The plots generally made a good growth but were severely checked by the hot dry weather experienced in August, September, and early October. Two plots failed, namely, Quirindi and Curlewis. In the former case the ground could not have been prepared better, and everything was favourable until September, when the wheat burnt off. The soil is a deep alluvial, and lacks a clayey subsoil, and this was the cause of failure. No soil lacking a retentive subsoil can resist extreme dry weather. Many examples of this were apparent last season. The summer-fallowed plots all made a better growth and resisted the dry weather longer than the unfallowed plot.

At Curlewis the soil was of a better type: here again the fallowed plots made a better growth than the unfallowed plot, but eventually the weather proved too dry. Mr. W. T. Penrose's plots at Boggabri were the only other plots located on soil lacking a clayey subsoil, and here the late maturing varieties failed, while the early ones yielded up to 10 bushels per acre. All the other plots gave from fair to good returns for the season experienced.

The Manilla plots were greatly damaged by rabbits, yet averaged 7 bushels per acre, while the crops in the district were practically a failure. Mr. F. Jordan's plots at Boggabri were lightly fed off by horses in June, and this proved the undoing of the quick maturing varieties, especially Bunyip and Florence, the later varieties not being checked to the same extent. There was no rain after feeding-off.

The Pallamallawa plots were sown at the end of April, and heavy rains in May with warm weather in June produced a rank growth which was severely attacked by rust, necessitating the feeding-off of the plots in July, which checked them considerably. Frosty weather in July and August checked the development of the rust.

The season suited early sowing. The most suitable sowing period is from mid-April to mid-June in the earlier districts, and a little later in the cooler districts. On sandy soil, which does not produce a rank growth, and on roughly prepared land, the sowing may be a little earlier, but either Marshall's No. 3, Yandilla King, or Rymer should be used for such sowing to minimise risk of frosting in the spring, which is not an uncommon occurrence in the north-west; also, should too rank a growth be made, they can be fed off when 7 or 8 inches high, and will respond well. It is only on the richer soils that feeding off is necessary. Very late sowings are unsatisfactory unless the season just happens to suit them, which has not been the case for the past few years. Planting should be earlier for hay than grain.

On all soils which "set," harrowing the growing crop is an advantage, especially in dry seasons, and in such cases the tramping of sheep when feeding off often has a similar effect, provided the ground is not too wet.

The harvesting was early last year, similar to that of 1913, but in the districts between Moree and Inverell harvesting operations were considerably delayed by unfavourable weather conditions. No disease was very noticeable, save that there was a considerable amount of powdery mildew and rust in June and early July in the early crops at Pallamallawa and Gravesend which were soon checked by the advent of frosty weather.

Variety Trials.

Reference to Table III will show the results obtained from the different varieties.

Owing to the wide variation of the character of the season, and the fact that many varieties were sown only in a few plots, a reliable basis of comparison cannot be obtained.

By taking as a check, Federation, which was sown in every plot, a rough comparison may be made, which will place the varieties in the following order of merit: Marshall's No. 3, Yandilla King, Bunyip, Rymer, and Federation. This is in keeping with previous seasons' results. The varieties are dealt with in detail below:—

Marshall's No. 3, with *Yandilla King* and *Rymer*, have all proved good dual-purpose wheats and especially good grain yielders. They stood the drought conditions well last year. These wheats are all suitable for early and mid-season sowing.

TABLE III.—Variety Trials for Grain, North-western District, 1914.

Variety.	S. Forge, Tamworth.		Bignall Bros., Manilla.		E. Currell, Barraba.		J. H. McDonald, Gunnedah.		R. A. Studd, Boggabri.		W. T. Penrose, Boggabri.		F. Jordan, Boggabri.		W. Palmer, Narrabri.		E. J. H. Goodsell, Pallamallawa.		J. R. Coulton, Gravesend.		W. Tonkin, Delungra.	
	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.
Cleveland	......				......		......		......		......		......		......		......		......		§21	34
Yandilla King	8	30	7	13	21	57	9	23	19	23	......		10	21	18	40	18	30	24	58	23	38
Marshall's No. 3	8	12	9	4	22	13	12	0	18	52	......		13	23	......		15	21	22	15	24	56
Rymer	5	45	6	19	17	48	10	43	17	24	......		13	8	19	22	18	13	19	0	25	16
Federation	7	20	5	7	19	23	11	17	15	29	4	0	8	36	20	57	19	2	19	33	25	21
Droophead Federation... ...	......		4	8	......		......		......		......		......		......		......		20	20	......	
Bunyip	8	47	......		20	57	13	51	17	40	9	31	‡4	33	17	47	†9	1	17	8	21	12
Florence	......		......		15	36	......		......		......		8	45	12	17	......		......		......	
Firbank	......		......		......		......		13	36	......		‡5	34	......		......		......		......	
Cumberland	......		......		......		......		......		......		6	44	......		......		......		......	
Cedar	......		......		15	45	......		14	23	......		......		......		......		......		20	16
Gluyas Early	......		......		......		......		17	0	......		......		......		......		......		......	
Steinwedel	7	57	......		......		......		......		......		......		......		......		......		......	
Farmer's Friend	......		*7	49	......		......		......		......		......		......		......		......		......	
Commonwealth	......		......		......		......		......		......		......		15	31	......		......		29	0
Bomen	4	47	......		......		11	2	15	42	......		......		16	26	......		......		24	37
Canberra	......		......		......		......		......		10	54	......		......		......		......		......	
Nardoo	4	43	......		......		13	27	......		......		......		......		......		......		......	
Warren	......		......		......		9	52	......		3	3	......		17	44	14	47	......		......	
Huguenot	......		......		......		......		......		......		12	2	......		......		......		......	
Comeback	......		2	49	......		......		......		......		......		......		......		16	18	......	
Thew	......		......		......		......		......		......		......		......		......		16	29	......	

* Benefited by soakage. † Seriously damaged by storm. ‡ (2) Seriously damaged by feeding off. § Inferior germination.

Bunyip has again proved to be the best of the early-maturing wheats and a good drought resister. It is recommended for grain only, and is suitable for mid-season and late sowing. In rich soils in good seasons it is very apt to lodge.

Federation has not done quite so well as in 1913, but, nevertheless, has given satisfactory returns. It did not stand the dry weather as well as the wheats mentioned above. It is suitable for mid-season sowing and for heavy soils on which it will not lodge, and is recommended for grain only.

Cleveland is recommended for early and mid-season sowing for both hay and grain in the cooler districts only.

Cedar has not proved a satisfactory grain yielder and is not recommended. It yields best in the cooler districts.

Warren has not yielded as well this year as in previous years, when it has usually proved a good drought resister. It is only recommended for limited mid-season sowing, and as it is weak in the straw should not be sown on the rich scils.

Florence is a quick-growing wheat suitable for mid-season and late sowing, especially in the drier districts, but for grain production Bunyip is a better wheat. Florence is liable to shell.

Comeback is not a good drought resister and is therefore only suitable for the cooler districts for hay and grain. Only limited mid-season and late sowings are advised.

Huguenot yielded well at Boggabri, proving itself a good drought resister. It is useless for the production of milling wheat, and was only tested to see how it would yield for macaroni purposes. It should be sown early.

Firbank is not a satisfactory grain wheat, Florence and especially Bunyip being preferred. It is a first-class hay wheat, and should be sown mid-season.

Thew is not recommended for grain, but is a satisfactory hay and green fodder wheat. For hay it should also be sown mid-season.

The following farmers' varieties were tested :—Droophead Federation, Gluyas' Early, Steinwedel, and Cumberland. *Droophead Federation* originated in the Manilla district, where it is also known as Early Blue, and it is also grown to a limited extent in the Gravesend district. Federation is generally a better yielder. *Gluyas' Early* is grown a little in the Boggabri district, where it is also known as Long Berry Purple Straw. It is a good hay wheat, but is not recommended for grain, being very weak in the straw. *Steinwedel* is an early wheat, liable to shell. It is an excellent drought resister, and is therefore recommended for the dry districts beyond Narrabri, where it is suitable for mid-season sowing. *Cumberland* is a fairly quick-maturing wheat, to which Bunyip is preferred.

The following new wheats were tested :—Nardoo, Commonwealth, Bomen, and Canberra. *Nardoo* gave the second highest yield at Gunnedah, and is therefore worthy of further trial. *Commonwealth* topped the yields at Delungra with 29 bushels per acre and gave a fair yield at Narrabri, so that

it is certainly worthy of further trial, especially in the cooler districts. It is similar to Federation in many respects. *Bomen* was tried for the second year and yielded fairly well. It does not resist drought, but seems to be a suitable wheat for the cooler districts. *Canberra* was only sown in one plot at Boggabri, where it proved to be an earlier ripening wheat than Bunyip and also topped the yields. It should prove a good wheat for the drier districts, and will be tested again next year.

The Influence of Fertilisers.

The results of the fertiliser trials are shown in Table IV, and support the conclusion already arrived at as the result of five years' previous experiments, namely, that the application of fertilisers to the average wheat soils in the north-west is not a profitable practice. As a result of manuring, decreased yields were obtained in two plots, with a slight gain at Tamworth, and an increase of about 3½ bushels per acre at Narrabri, where the soil was of a fairly sandy nature. On the light sandy soils that occur in portions of the Narrabri district, and on old worn-out paddocks in any district, the application of about 56 lb. of superphosphate per acre is recommended, but not elsewhere.

TABLE IV.—Manurial Trials for Grain, North-western District, 1914.

Experimenter.	Variety.	Yield per acre.		Increase.	Decrease.
		Manured with 70 lb. superphosphate per acre.	Unmanured.		
		bus. lb.	bus. lb.	bus. lb.	bus. lb.
S. Forge, Tamworth ...	Rymer ...	7 38	5 45	1 53	......
W. T. Penrose, Boggabri ...	Federation ...	failure.	4 0	......	4 0
F. Jordan, Boggabri ...	Florence ...	6 27	8 45	......	2 18
W. Palmer, Narrabri ...	Bunyip ...	17 47	14 29	3 18	......

The Effect of different Rates of Seeding.

Seeding trials were conducted in eleven districts for grain, plots being sown in each case at the rates of 30, 45 and 60, or 35, 50 and 65 lb. per acre, and with good stooling and also rather scanty stooling varieties. Extensive seeding experiments in 1913 proved that the sowing of smaller quantities of seed per acre than 35 lb. was not advisable, hence these experiments were considerably modified for 1914. The results obtained are given in Table V. It will be seen that out of eleven tests the thin seedings have topped the yields three times, the medium three times, and the thick four times, with the thin and thick a tie in one plot. However, in most cases the differences have not been high, and the averages for each rate of seeding show similar results. As the drought conditions prevailing favoured the thin seedings, this year's results only strengthen the conclusion drawn from last year's experiments

that it is advisable to drill from 45 to 55 lb. of graded seed per acre, according to the kind and condition of the ground, variety used and time of sowing. The minimum amount of seed would be used when sowing a good stooling variety early on well prepared rich land.

TABLE V.—Seeding Trials for Grain, North-western District, 1914.

Experiment Plot.	Variety.	Quantity of Seed sown per Acre.											
		30 lb.		35 lb.		45 lb.		50 lb.		60 lb.		65 lb.	
		bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.
Tamworth	Rymer ...	...		5	32	...		5	45	...		5	23
Manilla	Marshall's No. 3	...		7	8	...		9	4	...		10	0
Barraba	Rymer ...	...		15	55	...		17	48	...		20	13
Gunnedah	Marshall's No. 3	13	58	...		12	0	...		13	58	...	
R. A. Studd, Boggabri ...	Rymer ...	16	3	...		17	24	...		18	29	...	
W. T. Penrose, Boggabri	Federation ...	6	33	...		4	0	...		3	9	...	
F. Jordan, Boggabri ...	*Florence ...	10	7	...		8	45	...		5	38	...	
Narrabri	†Bunyip ...	...		15	16	...		17	47	...		12	44
Pallamallawa	Federation ..	16	43	...		19	2	...		18	5	...	
Gravesend	Marshall's No. 3	...		22	37	...		22	15	...		21	37
Delungra	Yandilla King	23	49	...		23	28	...		24	40	...	
Average		14	32	13	18	14	6	14	32	14	0	14	0

* A scanty stooling wheat. † A rather scanty stooling wheat.

Cultivation Tests.

Reference to the "Cultural Notes" will show that cultivation tests for grain were carried out at Pallamallawa and Gravesend. At Pallamallawa the March ploughed plot yielded 19 bushels 2 lb. per acre, while the April ploughed plot yielded 19 bushels 18 lb. or slightly higher, Federation being sown in each case. The March ploughed land was disc-ploughed and harrowed twice, and these operations, combined with heavy falls of rain in March, totalling 778 points, set the ground so that it was not in the best of condition at sowing time. The April ploughed land was really in better condition, and after sowing 646 points of rain were received in May, which entered the late ploughed land more readily than the early ploughed land, and was afterwards available for the use of the crop. The two plots gave practically the same yield because of the heavy rain received in May after both had been ploughed. As the average falls for April and May in this district are only about 142 and 172 points respectively, while the heavy falls

are usually received in the preceding three months, the advantage gained in all normal seasons from early ploughing will readily be seen, especially where the land is so cultivated as to minimise setting.

At Gravesend the February ploughed plot yielded 22 bushels 15 lb. per acre, while the March ploughed plot yielded 16 bushels 51 lb., or 5 bushels 24 lb. less than the early ploughed plot, Marshall's No. 3 being sown in each case. Reference to Tables I and II will show that these plots received only about half as much rain in May as the Pallamallawa plots, and hence the value of the extra moisture conserved by the early ploughing, which resulted in an increased yield of about 5½ bushels per acre, actually worth £1 7s. 6d. to the grower. The uniformly higher average results obtained on the experiment plots during the last six years, and also by progressive farmers, as compared with the average crops of the various districts, clearly illustrates the value of early ploughing. Stubble land should be ploughed as soon as possible after harvest, in December, January, and February, for preference, and in the Moree-Inverell districts, where heavy summer rains are experienced, all light and medium stubbles should be ploughed in to maintain the humus content of the soil. Early ploughing, and the good summer rains generally experienced, will ensure the decomposition of the straw. In the other districts, where the rainfall is rather lower, the light stubbles should be ploughed in, and the heavier ones burnt, unless the season proves a wet one, when most of the stubbles may be ploughed in. When ploughing is late it will generally be found that stock have trampled the straw well down, so that it readily becomes incorporated with the soil. The best average depth to plough is about 5 inches, but for late ploughing or for sandy or new ground the depth may be a little less. On the clayey soils which set readily the mould-board plough is preferred, as the ground is then less liable to set, otherwise the disc plough is generally the most economical plough to use. On soils which set readily the best cultivating implements are the skim ploughs, scarifier-cultivators and spring-tooth cultivators. Constant use of the harrows on such soils should be avoided. On the sandy soils one-way disc cultivators and harrows are the most efficient and economical cultivating implements. In all cases weeds should be controlled as much as possible by grazing with sheep, and the ground only cultivated when it has set, usually after heavy rains, when a crop of young weeds is also often destroyed. The value of a long fallow, *i.e.*, ploughing from June to September, is undisputed where a paddock is foul with black oats and weeds, but purely for moisture conservation a system of summer fallowing as described above seems to be just as efficient.

Drill v. Broadcast Sowing.

At Manilla a plot sown broadcast with a spring-tooth cultivator was tested against a drilled plot, 65 lb. per acre of Marshall's No. 3 being sown in each case. The broadcasted plot did not germinate as well as the drilled plot, and was therefore in keeping with the well known fact that the use of a drill means the saving of seed, since less seed per acre is required. The broadcasted plot

yielded 4 bushels 4 lb. per acre, and the drilled plot 10 bushels, or an increase in favour of drilling of practically 6 bushels per acre. Rabbits extensively damaged these plots, but still they were harvested in such a manner as to obtain the most accurate yields. Although the difference in the yields is much greater than would usually be the case, the advantage of uniform drilling is distinctly shown. The disadvantage of broadcast sowing is that the seed is scattered irregularly and covered at all depths, so that unless the ground is very moist, or a good rain is received promptly, an uneven germination is obtained, thus necessitating the use of more seed. For placing the seed into the moist lower soil of well-worked land a drill is really indispensable. On the rich black soil in the Inverell district, in a wet sowing season, the use of a drill is unsatisfactory, but the area of wheat sown on such soil is not very great. Although the use of the drill is now fairly general in the north-west there is still a considerable area of wheat broadcasted, especially in the Manilla, Attunga, and Inverell districts.

The Inverell Hay Trial.

The results obtained are given in Table VI. Zealand, the well-known Riverina hay wheat, topped the yields. This variety has given Messrs. Kook Bros. very good hay yields over a number of years. Its only fault is that it is liable to lodge. Rymer came next in order of merit, and was followed by Firbank. Both these varieties can be recommended with confidence for hay. Huguenot gave practically the same yield as Firbank. This beardless macaroni wheat is useless for the production of grain for milling, but a few years ago it attained a reputation in South Australia as a hay wheat which it has generally failed to maintain in this State. However, it should be at its best in the Inverell district, and will be given a further trial next year. Its straw is fairly solid, which largely accounts for its heavy yields of sweet hay. The general objection to it is its harshness, especially that of the glumes, but cutting on the green side will control this to a considerable extent. Nardoo and Bomen have not yielded very well, but as the season was an unfavourable one Nardoo will be given a further trial. Bomen, however, is not considered very suitable for hay.

In the seeding trials the various quantities of seed sown have given very similar results, and, taken in conjunction with the results obtained from the 1913 seeding trials, when 25 lb. per acre topped the yields, which gradually decreased as the seedings became heavier, would seem to indicate that from 30 to 40 lb. of well-graded seed per acre is sufficient for hay on the black soils of the Inverell district, when the same are well worked and seasonably sown. These quantities, however, represent the minimum, and heavier seedings would naturally be required for lighter-soiled, older, and roughly-worked paddocks, also for late sowing and when ungraded seed is used.

The cultivation test strikingly demonstrates the value of early ploughing, for while the summer fallowed plot yielded 29½ cwt. of hay per acre, the unfallowed plot only yielded 12 cwt., or about 40 per cent. of the yield of the former plot.

Table VI.—Variety, Seeding, and Cultivation Trials for Hay, North-western District, 1914.

Experimenters: Messrs. Kook Bros., Inverell.

Variety and Quantity of Seed sown per acre.		Yield.		
	lb.	ton	cwt.	qrs.
Firbank (unfallowed)	45	0	12	0
Firbank	45	1	9	2
Firbank	30	1	9	1
Firbank	60	1	11	0
Zealand	45	1	14	1
Rymer	45	1	12	1
Huguenot	50	1	9	1
Nardoo	45	1	0	2
Bomen	45	0	19	2

SOUTHERN AND SOUTH-WESTERN DISTRICTS.

H. C. STENING, Inspector of Agriculture.

WHEAT experiment plots were established for the season 1914 in sixteen different districts in the Riverina and South-western Slopes, and in each locality a trial of varieties and a manure test were conducted. The names and addresses of the wheat-growers who co-operated with the Department in carrying out the experiments are as follows:—

Mr. M. J. Carew, "Selbourne," Deniliquin.
Mr. J. Charles, "Stoneleigh," Grong Grong.
Mr. W. Cruickshank, "Eurowie," Marsden.
Mr. R. O. Eulenstein, "Gracevale," Henty.
Messrs. D. and J. Gagie, "Spy Hill," West Wyalong.
Messrs. W. Gall and J. Besley, "The Cottage," Yuluma, *viâ* Urana.
Mr. F. Gollasch, "Pine Park," Milbrulong.
Messrs. C. H. and A. Hulme, "Burnley," Germanton.
Mr. R. A. Mills, "Los Angeles," Ariah Park.
Mr. J. Phipps, "Waratah," Berrigan.
Mr. J. Ryan, "Pine Hill," Jerilderie.
Mr. B. J. Stocks, "Linden Hills," Cunningham, near Harden.
Mr. W. Tait, "Stromness," Ringwood, *viâ* Corowa.
Mr. H. G. M. Thackeray, "Wootoona," Young.
Mr. E. G. Wenke, "Sunnyside," Walla Walla.
Mr. W. Wingate, "Thornleigh Park," Sandigo, *viâ* Narrandera.

The Season.

The wheat-growing season of 1914 will long be remembered by wheat-growers in Riverina as the driest on record. Taking the Wagga district as an example, only 10·05 inches of rain were registered at the Wagga Post Office for the whole year, which is 1¾ inches lower than the rainfall of the driest year previously recorded, viz. 11·82 inches in 1902; as far back as records have been kept, *i.e.*, since 1871, there was only one other annual rainfall, 14·79 inches in 1898, apart from that of 1902, which totalled less than 15 inches; yet in the years 1912 and 1913 there were only 15·16 and 15·98 inches respectively. This great shortage of rain during the two preceding years considerably aggravated the position by reason of the fact that the subsoil carried no reserve of moisture.

Excepting at the Marsden plot, the autumn rains were sufficient to ensure germination. At Wyalong, however, a considerable proportion of the seed was destroyed by the ravages of wireworms; and at a few plots, notably at Germanton, the young wheat plants failed to appear above ground, owing to the twisting of the seedling below the surface.

This latter trouble was also experienced the preceding season, and upon investigation the only reasonable cause appears to be that light showers, falling subsequent to sowing, create a crust on the surface of the soil, which the growing point of the seedling fails to penetrate and, therefore, twisting below the surface occurs.

Owing to the mild autumn, a good early growth was made by the earlier sown crops, and as the moisture supply diminished, there was a tendency for some crops to form a shot-blade early in June. This necessitated the feeding-off of the crop owing to the danger of it becoming frosted if allowed to run into ear so early.

The total winter rains during the months of June, July, and August were the lowest ever recorded, and were reported by the Meteorological Department to be 78 per cent. below the average for this period in Riverina, and 68 per cent. below in the South-western Slopes, while in some districts not a drop of rain fell during the month of August.

This was followed up by the most disastrous spring ever experienced. Unseasonably hot weather prevailed during the first week of September, causing crops to wilt, with every appearance of failing, but with the return of cooler conditions, the crops revived.

In some districts, late frosts occurred during the fourth week of September, and were very severe on 26th and 27th September, causing considerable damage to the plots at Young, and even the ears of those varieties which were yet in the shot blade were frosted. During the greater portion of the month of October hot winds raged continually, with temperatures ranging from 95° to 100° Fahr., and in several districts there was no rain for the

whole month. These extremely adverse conditions were responsible for the crops maturing very early, and they were ready for the harvesters about three weeks earlier than in normal seasons.

The following table shows the rainfalls recorded during the growing period of the crops at the farms, where the experiments were conducted :—

TABLE I.—Showing the Rainfalls during the Growing Period, 1914.

Southern and South-western Districts.

Month, 1914.	Henty.	Ringwood.	Harden.	Berrigan.	Wyalong.	Walla Walla.	Yuluma.	Ariah Park.	Sandigo.	Young.	Milbrulong.	Grong Grong.	Germanton.	Jerilderie.	Deniliquin.	Marsden.
	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.
March	...	...	...	...	52	...	...	...	...	...	...	...	...	...	...	...
April	...	...	...	...	65	...	...	15	79	...	...	67	...	...	...	40
May	127	151	10	130	81	226	175	108	111	...	152	107	30	120	133	40
June	18	75	86	52	127	100	116	107	101	26	104	91	100	46	28	40
July	24	63	140	28	29	77	29	27	53	225	22	21	40	30	29	22
August	14	40	10	36	0	40	0	36	24	4	22	11	50	30	0	0
September ...	15	25	96	28	53	51	11	21	11	80	31	10	10	8	14	25
October	0	8	60	0	50	2	0	15	0	86	0	0	0	0	0	62
November ...	14	...	100	...	...	28	...	...	...	57	...	...	...	...	...	...
Total ...	212	362	502	274	457	524	331	329	379	478	331	307	230	234	204	229

These totals were made up for the most part by light showers of less than 20 points, and were practically of no service to the crops; and in most districts only one fall exceeded half an inch. It will be seen that in every instance the total rainfall during the growing period was lamentably low and in itself totally inadequate for crop production; yet payable crops have been produced by the adoption of methods commonly known as "dry-farming," by means of which the rains during the period of growth were supplemented by those falling prior to sowing. Unfortunately the latter were also of an extremely light character, and further militated against the production of light yields.

Records of the rainfalls during the fallowing period, *i.e.*, between the times of ploughing and sowing, are available for a few districts and are shown in Table II.

TABLE II.—Showing Rainfall during the Fallow Period, 1914.

Southern and South-western Districts.

Month, 1913.	Henty.	Ringwood.	Wyalong.	Germanton.	Jerilderie.	Deniliquin.	Marsden.
	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.
July	...	...	32	...	31	54	50
August	...	...	34	...	51	54	20
September	...	156	33	..	199	176	0
October	128	225	169	86	113	126	39
November	62	34	9	25	22	0	0
December	41	41	67	80	38	0	76
1914.							
January	78	68	68	63	14	0	50
February	160	0	62	150	14	0	100
March	437	229	135	152	74	0	30
April	91	99	...	120	65	67	...
May	...	...	...	141	...	...	...
Total	997	852	609	817	621	477	365
Rainfall during growing period.	212	362	457	230	234	204	229
Total rainfall during fallow and growing periods combined.	1,209	1,214	1,066	1,047	855	681	594

These rainfalls, taken in conjunction with the yields obtained, demonstrate the value of fallowing. The best yields were obtained at Henty, which, although the rainfall during growth just exceeded 2 inches, had the advantage of good rains in March, two months before sowing. These, conserved in the fallow, were of great service to the crops, and yields of up to 20¾ bushels were obtained. Originally it was the general opinion that 10 to 12 inches of rain were necessary during the growing period for the production of a payable crop. Yet no more than this amount fell during the 14 to 16 months comprising the fallow and growing periods combined. Payable crops produced under these conditions stand as a great tribute to the value of fallowing. At Marsden, Deniliquin, and Jerilderie the fallow rains were so light that the amount of moisture conserved was altogether inadequate to sufficiently supplement the extremely low rainfall during the growing period, and the total rainfall for the whole 16 months fell considerably short of 10 inches, and as a consequence the plots sown in these districts resulted in total failures. It will be generally conceded that with such a limited supply of rain during both fallow and growing periods crop production is impossible.

At Marsden a large proportion of the seed which was sown early in April was still lying in the ground in a sound condition at the end of September,

while the remainder of the seed had moulded or malted as the result of light showers. At Deniliquin and Jerilderie the seed germinated after a good rain on 13th May, but as there were no subsequent rains sufficient to support plant growth, the crops perished. It was the general experience that land well supplied with nitrates, such as rich flats and new land, suffered most severely under the very limited supply of moisture, and it was for this reason that the plots at Germanton, which were situated on a rich creek flat, failed completely, and the plots at Grong Grong and Milbrulong on land cropped for the first time yielded so poorly. In spite of the bad season the samples of grain throughout were good.

Cultural Notes.

Henty.—Soil loam, new land; ploughed 4½ inches deep in September, 1913; harrowed October; cultivated with spring-tooth, March; harrowed end of April; seed drilled at the rate of 55 lb. per acre on 4th and 5th May; harvested 2nd December.

Ringwood.—Red loam soil; three crops previously; ploughed 4½ inches deep in August; harvested October; spring-toothed first week April; drilled on 7th May, at rate of 53 lb. per acre; harrowed after first rain after sowing; harvested 1st December.

Harden.—Light loamy soil; five years in cultivation; ploughed 5 inches deep in July; harrowed September; skim-ploughed October; scarified last week in April; harrowed May; drilled 14th and 15th May, at rate of 53 lb. per acre; crop harrowed August; harvested 1st and 2nd December; ears of Canberra frosted September.

Berrigan.—Chocolate loam, which had been under cultivation for nineteen years; ploughed 5 inches deep in August; harrowed first week in September and last week in October; disced last week in March; harrowed first week in April; drilled 21st and 22nd April, at rate of 50 lb. per acre; harrowed after drilling; harvested 18th November.

Wyalong.—Chocolate loam; four crops previously; ploughed first week July; spring-toothed middle August; disced first week October; spring-toothed last week February; harrowed last week March; drilled 25th and 26th March, at the rate of 50 lb. per acre; crop fed-off with sheep, and harrowed first week June; harvested 11th November; a large proportion of the seed was destroyed by wire-worms; "Thew" tipped by frost.

Walla Walla.—Buff loam; 25 crops previously; ploughed 5 inches deep in August; harrowed October; scarified early February and middle April; harrowed May; drilled 11th and 12th May, at rate of 60 lb. per acre; harvested 27th November; a proportion of ears of Federation frosted.

Yuluma.—Chocolate loam; not cultivated for twelve years; ploughed 5 inches deep in August; harrowed August; disced first week April; drilled at rate of 53 lb. seed per acre; harvested 10th November; Firbank and Florence ears tipped by frost.

Ariah Park.—Red loam; ploughed 4½ inches deep in July; spring-toothed October; harrowed January, and prior to drilling; drilled 30th and 31st March at rate of 44 lb. seed per acre; crop fed off with sheep in June and harrowed; harvested 28th November.

Sandigo.—Red silty loam, with subsoil a great distance from surface; five crops previously; ploughed July 4½ inches deep; harrowed August and September; spring-toothed fourth week October, third week January, and last week March; drilled 1st and 2nd April, at rate of 50 lb. seed per acre; crop fed off in June; harvested 28th November.

Young.—Sandy loam; four wheat crops and one lucerne crop previously; ploughed July; harrowed September; cultivated with spring-tooth first week in March; cross-cultivated fourth week March; harrowed first week May; cross-harrowed second week May; harrowed prior to drilling; drilled 19th and 20th May, at rate of 55 lb. seed per acre; harvested 22nd December; crops were badly frosted on September 26th and 27th.

Milbrulong.—Red loam, new land; ploughed 4½ inches deep first week July; harrowed 3rd and 15th September; spring-toothed third week in March; scarified last week in April; drilled May 1st and 2nd, at rate of 50 lb. seed per acre; harvested 23rd November.

Grong Grong.—Red loam, new land; ploughed 4 inches deep in August; harrowed November; spring-toothed third week March and second week April; harrowed before drilling; drilled on 14th and 15th April, at rate of 50 lb. per acre; harvested 7th November.

Germanton.—Grey alluvial; old cultivation land; spelled for a number of years, and since cropped for two years; ploughed September 5½ inches deep; harrowed October; disced November and May; harrowed before drilling; drilled 21st and 22nd May, at rate of 50 lb. per acre; crops failed to mature grain.

Jerilderie.—Red clay soil; twenty-four years in cultivation; ploughed 4½ inches May; harrowed September; disced January; spring-toothed April; harrowed before drilling; drilled 23rd and 24th April at the rate of 50 lb. per acre; seed germinated in May, but insufficient moisture to support growth, and the young plants perished.

Deniliquin.—Dark grey clay loam, new land; ploughed 4 inches deep in July; harrowed October; spring-toothed March; harrowed before drilling; drilled 25th April at rate of 50 lb. seed per acre; seed germinated in May, but insufficient moisture to support growth, and young plants perished.

Marsden.—Black clay loam, new land; ploughed July; harrowed second week August; spring-toothed second week October; harrowed second week January, first week March, and first week April; drilled 6th and 7th April, at rate of 50 lb. seed per acre; seed ungerminated at end of September.

TABLE III.—Showing Results of Variety Trials—Yields per acre, Southern and South-western Districts, 1914.

District.	Federation.	Yandilla King.	Bomen.	Canberra.	Marshall's No. 3.	Cedar.	Firbank.	Bunyip.	Commonwealth.	Rymer.	Cleveland.	Thew.	Comeback.	Warren.	Florence.	Currawa.	Wallace.	Avoca.	College Purple.	Warden.	Viking.
	b. lb.	b. lb.	b. lb.	b. lb.	b. lb.	b. lb.	b. lb.	b. lb	b. lb.	b. lb	b. lb.	b. lb.	b. lb.	b. lb	b. lb.	b. lb	b. lb.	b. lb.	b. lb	b. lb.	b. lb.
Henty	19 46	17 4	16 10	20 45	15 54	10 1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Ringwood	14 44	16 30	13 33	..	..	..	11 3	15 20	13 20	..	..	..	..	..	..	..	..	..	..	..	..
Harden	15 41	15 55	15 9	11 20	..	..	..	..	..	13 32	9 41	..	..	..	..	..	..	..	..	..	..
Berrigan	12 39	11 39	11 27	14 26	..	..	..	10 25	..	..	..	12 9	..	..	..	..	..	3 44	..	..	..
Wyalong	11 6	11 13	10 37	10 16	..	..	..	..	..	10 57	..	8 35	..	..	..	..	..	..	..	..	..
Walla Walla	8 47	9 8	9 14	..	9 12	..	..	..	..	10 52	8 17	..	..	..	..	..	..	..	..	..	..
Yuluma..	10 47	11 54	9 15	..	..	..	4 15	..	..	9 13	..	..	..	..	7 32	..	..	..	..	..	..
Ariah Park	4 29	5 35	4 24	..	..	..	..	..	..	6 1	..	..	..	6 13	2 44	5 28	..	..	..	..	..
Sandigo..	5 39	4 59	3 54	..	..	..	..	3 3	..	..	..	..	3 12	7 26	..	..	..	..	..	..	..
Young	2 38	3 54	2 19	..	4 20	1 36	..	..	..	..	..	..	1 0	..	..	4 9	4 0	..	4 9	..	2 40
Milbrulong	4 11	2 20	1 40	..	..	2 3	..	..	2 38	..	..	..	3 0	..	..	..	3 14	..	..	2 29	..
Grong Grong	2 11	1 25	1 25	..	..	..	..	1 9	1 43	..	..	1 16	..	..	..	..	..	..	..	..	..
Actual averages	9 22	9 18	8 15																		

Details of Varieties.

Accurate average yields for comparative purposes are only possible when the varieties are sown on all plots. The averages of Federation, Yandilla King, and Bomen, which were sown in every district, are available, and the value of the other varieties may be gauged by comparing their individual yields with these three varieties.

Federation has again upheld its reputation as a grain-yielder, even under drought conditions, and still holds pride of place as the safest variety for the main crop. It has been demonstrated, as in the previous season, that when an early germination is assured *Yandilla King* is a worthy rival of Federation in the production of grain, while in addition providing the alternative of a good hay yield. The value of including dual-purpose wheats among the varieties sown was emphasised during the past season. Owing to the threatened scarcity and more profitable prices of fodder, many farmers would have preferred to have harvested their crops as hay rather than allow them to stand for a grain crop, but their crops of Federation in most cases were altogether too short for the purpose.

Marshall's No. 3 and *Rymer* are also well-tried late-maturing varieties which yielded good crops of both grain and hay, but are not quite so strong in the straw as Yandilla King. Although *Cleveland* did not give a very good account of itself, it may still be recommended for the colder districts, but requires to be sown earlier.

Other promising late varieties are *Currawa*, *Wallace*, *Avoca*, and *College Purple*. *Currawa* proved itself to be a good drought-resister, keeping a very fresh appearance throughout its period of growth; it also resists rust well.

Avoca, which has a great reputation in Victoria as a yielder, was tried at Berrigan. It matures a little later than Yandilla King, has a rather open head and apparently holds its grain rather loosely. It yielded a bushel more than Federation but was beaten by Canberra. Owing to its lateness in maturing it would, no doubt, give even better results in the later districts.

Warren is particularly suitable for the drier districts, and was top yielder in the two dry districts in which it was sown, emphasising its capacity as a drought resister.

Bomen, which matures a little later than Federation, suffered severely in the earlier stages from drought and frost, but finished up fairly satisfactorily, averaging a bushel per acre less than Federation and Yandilla King.

Commonwealth did not yield as well as Federation, which it somewhat resembles in appearance, but matures a little later.

Canberra, a variety bred at Wagga Experiment Farm, and introduced for the first time in the Farmers' Experiment Plots, proved a valuable acquisition to our early maturing varieties, than which it gave much better results. At

Henty and Berrigan it out-yielded Federation by 1 bushel and 1¾ bushels per acre respectively. The crop at Harden was unfortunately nipped by frost, and at Wyalong a storm just prior to harvesting caused a portion of the crop to lodge. It matures about the same season as Comeback, and, similar to this variety, makes a vigorous early growth. Like most of our early maturing varieties, it is inclined to be weak in the straw.

Bunyip and *Thew* gave the best results of the other early maturing varieties.

Acclimatised *v.* Introduced Seed.

For comparison with the seed introduced into the district by the Department, and grown at Wagga Experiment Farm, plots were sown at Wyalong and Harden with acclimatised seed. The latter was the product of seed introduced on the district experiment plots three years previously, and had since been carefully graded and grown in the district, and thus had three years for acclimatisation.

District.	Variety.	Yield per Acre.	
		Introduced Seed.	Acclimatised Seed.
		bus. lb.	bus. lb.
Wyalong	Federation	11 0	11 33
Harden	Yandilla King	15 55	14 4

At Wyalong, which is a drier district than Wagga, the introduced seed yielded 33 lb. less than the acclimatised seed, while at Harden, where the rainfall is more favourable than in the locality in which the introduced seed was produced, the introduced seed resulted in an increase in yield of 1 bushel 51 lb. over the seed produced in the district. These results tend to show that acclimatised seed will yield better than that introduced from a more favoured district, but not as well as seed introduced from a drier locality.

Manurial Experiment.

In all districts six plots were devoted to a test of fertilisers, as follows:—

84 lb. Superphosphate per acre.
56 lb. „ „
38 lb. „ „
{ 38 lb. Superphosphate } per acre.
{ 19 lb. Bone-dust. }
56 lb. Thomas' Phosphate „
No manure.

Federation was the variety used throughout the tests in the drier districts, and Yandilla King in the more favoured districts.

The following table shows the results of the tests:—

TABLE IV.—Showing Yields per acre of Manurial Experiments, Southern and South-western Districts, 1914.

District.	Variety.	84 lb. Superphosphate per acre.		56 lb. Superphosphate per acre.		38 lb. Superphosphate per acre.		38 lb. Superphosphate and 19 lb. Bone-dust per acre.		56 lb. Thomas' Phosphate per acre.		No Manure.	
		bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.
Henty	Yandilla King ...	15	28	17	4	14	54	14	46	14	18	14	10
Ringwood ...	Federation	15	6	44	44	13	58	13	53	10	52	8	50
Harden	Yandilla King ...	18	33	15	55	14	24	14	2	12	31	11	32
Berrigan... ...	Federation	18	0	12	39	14	25	14	23	12	36	11	20
Wyalong ...	,, ...	13	12	11	0	11	50	11	45	10	12	10	20
Walla Walla ...	Yandilla King ...	9	45	9	8	8	35	8	24	5	50	3	30
Yuluma	Federation	11	22	10	47	11	36	13	10	12	2	11	38
Ariah Park ...	,, ...	5	12	4	29	5	10	5	5	4	17	3	15
Sandigo	,, ...	4	11	5	39	6	6	5	53	5	55	4	22
Young	Yandilla King ...	4	6	3	54	4	36	4	21	3	37	5	1
Milbrulong ...	Federation	3	37	4	11	4	4	4	32	4	9	3	33
Grong Grong ...	,, ...	1	12	2	11	1	41	1	41	1	52	2	12
Average		9	58	9	18	9	16	9	19	8	10	7	28
Average Increase due to manure ...		2	30	1	50	1	48	1	51	0	42	..	...
Percentage increase		33%		24%		24%		24%		9%		......	

During the growing season, the remark was frequently made by farmers that they would have been much better off if they had not manured their crops, owing to the fact that at one stage the manured crops appeared to suffer from the effects of the drought more severely than the unmanured, which was simply due to the manured crops being more forward at the time. The above results do not bear out this contention, for an application of 56 lb. superphosphate has given an increase of 24 per cent., which is only 1 per cent. less than the increases obtained in similar tests in the previous years, 1912 and 1913; but 84 lb. superphosphate per acre has given even a larger percentage increase than in a more normal season. In 1912 the increase was 28 per cent., while the above results show an increase of 33 per cent. A mixture of two-thirds superphosphate and one-third bone-dust is vended by some fertiliser firms under the name of Special Wheat Fertiliser. The average yields do not show any improvement as the result of the inclusion of bone-dust. This may be due to the abnormality of the season, for bone-dust is a slow-acting manure, and requires more moisture to render its phosphoric acid available. Bone-dust also contains a small percentage of nitrogen, and as stated before, the presence of nitrates have apparently had a detrimental effect under the droughty conditions. It is probably on this account that in the majority of districts the yields resulting from applications of 38 lb superphosphate were slightly higher than those resulting from an application of 19 lb. bone-dust in addition to the 38 lb. superphosphate.

Thomas' phosphate gave a very small increase over the unmanured plot as compared with that resulting from an equal quantity of superphosphate. While the phosphoric acid contained in Thomas' phosphate is in a more soluble form than in bone-dust, yet it is not nearly so available as that in superphosphate, and it is owing to the greater solubility of its phosphoric acid that the higher yields have resulted from superphosphate. The phosphoric acid being available for the young plants in the seedling stage, a vigorous early growth is stimulated and the stooling capacity increased. Of course, the yields during the past year are no criterion of what may be the results under normal conditions, but it is a great point in favour of superphosphate that it is equally as efficacious during a droughty season as under more favourable conditions.

Lessons from the Season.

If the lessons to be learnt from the experience of the past season are thoroughly grasped by wheat-growers, it cannot be said that the drought has altogether been unproductive of good. It may be argued that there is very little probability of a recurrence of such an adverse season for very many years; yet even average seasons are frequently interrupted by dry spells, and the practice of methods that will ensure a safe crop in a droughty year will in most cases return a very profitable increase in normal seasons.

The experience of the past season will do much to sheet home to farmers the great value of fallowing and encourage them to make it a more general practice. Fallowing was responsible for the yields obtained with such a limited supply of moisture, and nearly all crops grown on unfallowed land were complete failures, and even land fallowed late in many cases failed to return a crop that could be harvested. At Ariah Park, land fallowed in July returned 6 bushels per acre, while land alongside, fallowed in October, and sown under otherwise similar conditions, with the same variety, was not worth harvesting. As soon as sowing operations are completed, no time should be lost in pushing on with the fallowing, so that the winter rains, which are usually the most abundant, may be conserved in the soil.

It is necessary to keep the surface of the fallow loose and free from weeds to prevent loss of moisture, but an added advantage of keeping the fallow clean has been demonstrated.

In some districts the young crops were seriously affected by the ravages of cutworms. The moth usually selects some plant growth upon which to lay her eggs, from which the cutworms soon hatch, so that dirty fallows become convenient breeding grounds for the pest, while crops grown on fallow kept clean should be free from the depredations of the cutworms, which usually do not travel far.

One of the great advantages of fallowing is the production of a firmly compacted seed-bed, which ensures rapid germination and a good supply of moisture to the young plants. In many cases, however, this seed-bed was destroyed by cultivating too deeply prior to sowing, thus rendering the seed-bed too loose for close contact of the soil with the seed and plant roots, and thus the germination and early growth was not satisfactory. The autumn cultivations of the fallow should be no deeper than 2 inches

As in the previous year, the best yields resulted from crops sown early, while crops sown late yielded very poorly, and many completely failed. In the earlier districts, sowing may be commenced with late-maturing varieties as early as the last week in March. Early sowing is conducive to deep rooting, owing to the surface soil being dry early in the season, and also allows the crop a better opportunity for stooling.

Crops sown before the middle of April will probably require to be fed off with sheep. Many wheat-growers allowed their crops to make too much growth before putting the stock on, and consequently they received a check. The best time to feed off is when the roots have taken a good grip of the soil and the plants have commenced to stool. The crops should be fed off quickly and not while the land is wet. When the feeding-off is completed, the land should be lightly harrowed. There were many instances where young wheat plants failed to appear above ground owing to the twisting back of the seedling, caused by a crusted surface. Where a crust is formed on the surface of the soil by showers falling subsequently to sowing, it should be broken by a light harrow.

Although the heavy dressing of 84 lb. of superphosphate returned a profitable increase, it would be wise to adhere to an application of 40 lb. to 50 lb. per acre until further tests have been conducted.

Liming Wheat Land.

Experiments to test the effect of the applications of lime on the wheat yield were conducted during the year 1914, at "Rockview," Old Junee, in conjunction with Mr. F. L. C. Ridgway, who manages the property for the Scottish Australian Investment Company, Limited. An area of 40 acres was set apart for the purpose and fallowed in August, 1913. Lime was applied in September by means of a lime distributor, one-third of the area being limed at the rate of 10 cwt. of air-slaked lime per acre; one-third at the rate of 5 cwt. per acre; and one-third left untreated.

The experiment was duplicated and was sown on 28th to 30th April, one half with Federation at the rate of 46 lb. per acre, and the other half with Yandilla King at the rate of 43 lb. per acre. Each block contained three plots, each over 2 acres in area, and manured as follows:—

54 lb. superphosphate per acre.
54 lb. Thomas' phosphate per acre.
Unmanured.

The crops were fed off with sheep in June, after which the land was harrowed. The rainfall during the growing period was 309 points, of which only two falls exceeded half an inch, and was distributed as follows:—

May	97 points
June	96 ,,
July	59 ,,
August	8 ,,
September	45 ,,
October	4 ,,
Total	309 ,,

The Federation crops were slightly affected by frost in September.

The following are the yields:—

Lime (air-slaked) per acre.	Manure per acre.	Yield per acre.	
		Yandilla King.	Federation.
		bus. lb.	bus. lb.
10 cwt.	54 lb. Superphosphate	8 3	7 6
10 ,, ...	54 lb. Thomas' Phosphate	5 36	4 57
10 ,, ...	No manure...	5 0	4 12
5 ,, ...	54 lb. Superphosphate	9 21	6 41
5 ,, ...	54 lb. Thomas' Phosphate	6 32	4 50
5 ,, ...	No manure	6 21	4 15
No lime	54 lb. Superphosphate	9 25	7 13
No ,, ...	54 lb. Thomas' Phosphate	6 18	5 31
No ,, ...	No manure...	5 24	4 38

The plots of Yandilla King, limed with 5 cwt. per acre, were at an advantage, as they were situated on rising ground, while the remainder of the plots were on low ground, which this season has grown inferior crops. Omitting those three plots, the limed plots have in every instance resulted in decreased yields when compared with the unlimed plots of the same variety similarly manured. This may be attributed to the increase in nitrates, as a result of the application of lime, which supplies the necessary base for the process of nitrification. Under the very abnormal conditions this season, land well supplied with nitrates, such as rich flats or land cropped for the first time, gave inferior returns, and in many cases completely failed. So the production of nitrates, which would have been beneficial in a normal season, has proved a positive detriment when the moisture supply is deficient.

It is intended to repeat the experiment on the same area during the coming season.

WESTERN DISTRICT.

W. R. BIRKS, B.Sc. Agric., Inspector of Agriculture.

The localities in this district in which wheat experiment plots were established for the season just closed are indicated below, together with the names of the farmers who undertook the work:—

Mr. W. W. Baird, "Cootha," Dubbo.
Mr. R. G. Barnard, "Hurcott," Wyanga.
Messrs. Bevan and Tayler, "Adaville," Parkes.
Messrs. J. Bell & Co., "The Wilgas," Botfields.
Mr. T. Bragg, Mungeribar.
Mr. H. J. Clements, "Curraweana," Brundah.
Mr. W. Fisher, "Coorawong," *viâ* Coonamble.

Mr. H. Green, "Kiaora," Forbes.
Messrs. Maitland Bros., "Munnel," Armatree.
Mr. C. J. Maslin, "Bogolong," Grenfell.
Mr. S. G. McCauley, "Osterley," Ootha.
Mr. A. J. Millar, Tullamore.
Mr. J. Parslow, "Kelvin Grove," Gilgandra.
Mr. A. G. Pritchard, "Rockdale," Manildra.
Mr. D. A. Rich, "Rozelayne," Wellington.
Mr. R. W. Shelton, "Elim Vale," Nelungaloo.

Preparation of the Land.

The practice of using for the experiments only land which had been "winter-fallowed," was strictly adhered to, and although the season (July 1913–April 1914) was anything but favourable for the purpose of getting the ground into good condition, nevertheless a thorough preparatory treatment was given in many cases.

The details of the working which the ground received in the different localities, together with information as to the nature of the soil and dates of sowing and harvesting are given in Table I.

TABLE I.—Showing Details of Soil, Cultivation, &c., Western District, 1914.

Locality.	Soil.	Approximate date of Fallowing	Subsequent Working.	Date Planted.	Date Reaped.
Wellington ...	Strong red loam ...	Aug. 17	Sk. Pl., Jan. 24 ... ... Hr., Mar. 7. Sp. Th., Mar. 30. „ before drilling.	Apl. 20 and June 2	Nov. 13 14
Gilgandra ...	Chocolate loam ..	Aug. 20	„ Sept. 14 and Oct. 18 ... Disc, Jan. 7, Feb. 23, and Mar. 31. „ before drilling.	Apl. 6 and June 3	Nov. 6–9
Armatree ..	Sandy loam, part black soil.	Aug. 25	Disc, Feb. 14 and Mar. 10 ... Disc before drilling.	May 15	Oct. 24 and Nov. 3
Dubbo... ..	High alluvial flat..	July 8	Sk. Pl., Nov. 3 ... ... Disc, Feb. 7. Sp. Th., before drilling.	„ 16	„ 17
Coorawong ...	Sandy red loam ...	July 6	Disc, Jan. 7 ... ... Hr., Jan. 27 and Feb. 24. Sp. Th., Mar. 24. Hr., April 4.	Apl. 30	„ 2
Parkes ...	Heavy dark clay...	July 15	Sp. Th., Sept. 30. ... ... Disc, Jan. 28. „ Mar. 12. Sp. Th., before drilling.	Apl. 23 and May 29	„ 10
Manildra ...	Strong red loam ...	July 20	Hr., Oct. 13. ... ... Disc, Jan. 14. „ before drilling.	„ 8	Dec. 6
Grenfell ...	Strong loam ...	Sept. 23	„ „	„ 6	Nov. 26

ABBREVIATIONS.—Sk. Pl. = Working with the Skim Plough; Sp. Th. = Working with the Spring-tooth Cultivator; Disc = Working with the One-way Disc Cultivator; Hr. = Harrowing.

TABLE I.—Showing Details of Soil, Cultivation, &c., Western District, 1914—*contd.*

Locality.	Soil.	Approximate date of Fallowing.	Subsequent Working.	Date Planted.	Date Reaped.
Brundah ...	Light loam ...	July 16	Sp. Th., Oct. 25 ... ... Disc, Mar. 3. Sp. Th., April 21.	May 7	Nov. 20
Mungeribar ...	Strong red loam ...	Sept. 15	Disc, Feb. 14 ... ... ,, before drilling.	,, 9	,, 25
Forbes... ...	Sandy red loam ...	July 7	Hr., Aug. 12 and Oct. 16 ... ... Disc, Feb. 24. ,, before drilling.	Apl. 25	,, 11
Nelungaloo ...	Heavy red clay ...	June 23	Hr., Oct. 26 ... ... Disc, Nov. 4. Sp. Th., Mar. 18.	Apl. 8 and May 20	Oct. 27 and Nov. 10
Botfields ...	Strong red loam ...	July 29	,, Mar. 1 ... ... Hr., before drilling.	Apl. 22	,, 12
Wyanga ...	Heavy dark clay...	Aug. 6	Hr., Jan. 14 and April 14 ... ... Disc, Mar. 16. Sp. Th., before drilling.	Apl. 18 and May 28	,, 13
Ootha	Strong red loam ...	Aug. 19	,, Nov. 4 and Jan. 1 ... ... Hr., Jan. 18 and Feb. 12. Sp Th., Mar. 18.	,, 18	,, 5
Tullamore ...	,, ,, ...	Aug. 11	Disc, Jan. 5 and Feb. 23 ... .. Sp. Th., Mar. 27. Hr., May 8.	,, 22	,, 3

ABBREVIATIONS.—Sk. Pl.=Working with the Skim Plough; Sp. Th.=Working with the Spring-tooth Cultivator; Disc = Working with the One-way Disc Cultivator; Hr.=Harrowing.

Seeding.

In the "dates of planting" column it will be noticed that two dates are shown with respect to some of the plots. In these cases an attempt was made to meet the relatively late and early maturing habits of different varieties by adopting correspondingly early and late sowing periods. Thus where two dates are shown the earlier one refers to the seeding of the late and mid-season wheats (namely, Marshall's No. 3, Yandilla King, Commonwealth, Rymer, Bomen, Federation, Warren, and Cedar), and the later date to that of the earlier wheats (Thew, Canberra, Comeback, Bobs, Florence, Firbank, Bunyip, and Sunset).

Some such discrimination in the times of planting different varieties is obviously necessary; however a more or less pardonable error was made this year in delaying the late sowings too long (till May 20–June 3). In ordinary years planting up to the end of May can be depended upon as being safe. This season, however, seeding carried out later than the middle of May proved more or less disastrous throughout the district. Crops so treated received little or no effective rain after they were a few weeks out of the ground—that is after the end of June—until they were beginning to mature and could not therefore be expected to make even moderate growth. The late-sown varieties were thus handicapped as compared with the others mentioned above, and their yields were relatively low in consequence in the localities where this double seeding was adopted.

The Season and General Results.

In summarising the general weather conditions during the period under review, a distinction can be drawn between the southern and western as against the northern parts of the district. The former—*i.e.*, the country lying west of the line Grenfell, Forbes, Parkes, Narromine, and Coonamble—experienced severe drought. Throughout the growing period, May-October, 1914, the total rainfall varied in different parts of the district from about 2½ to 5 inches, a great part of which fell in light and ineffective showers. On the average there were not more than three or four falls which could be considered as being of benefit to the crop, that is, falls approximating to or exceeding half an inch.

With special reference to the sowing period, a great variety of autumn conditions were experienced. In places no rain sufficient to promote complete germination occurred during the whole of the autumn and winter. This difficulty was felt more acutely on the heavy clay soils. With a poor start, the crops had then to face an almost completely rainless period from the beginning of July to the middle of September, when falls varying from about 20 points to three-quarters of an inch helped to revive such of the wheat as had survived the extraordinarily dry period. The only further rain was a series of similar scattered showers about the middle of October. The poor germination and consequent thin stand undoubtedly helped the crops in some cases to withstand the effects of this period of drought. Where autumn conditions were more favourable, notably at Forbes and Wyanga, and a luxuriant and dense young growth resulted, the effects of a rainless August were practically fatal to crops which in July promised particularly well. Thus the heavier autumn rains which fell in these localities eventually proved to be indirectly a disadvantage.

In reviewing the poor returns recorded below, it may possibly be objected that the much-advocated system of "fallowing" has this year failed to yield the results usually claimed for it. The sufficient explanation is, of course, the fact of a dry winter following a succession of two years of partial drought, a combination of circumstances which, to say the least of it, is likely to be of very rare occurrence. At fallowing time, 1913, the ground had already lain for twelve months without rain sufficiently heavy to reach the subsoil. From that time until the crop under review had ripened, a period of sixteen months, the total rainfall was 13 inches or less (11·08 inches only at Forbes), and the bulk of this rain was spread over a number of light, ineffective falls. Fallow was thus not able to function in its usual capacity, since little or no moisture reached the subsoil to be conserved there. In order to bring out this point more clearly, in Table II are set out the total rainfall which fell (1) on the fallow, and (2) on the growing crop in each locality, together with the average yield of each set of plots. Where a set of plots was sown on two different dates, early and late, as explained above, the rainfall which the late-sown varieties received during growth is shown separately. By "rainfall during growth" is understood the total rain which fell from the time of planting until the wheat had commenced to ripen

off; and it thus omits the very considerable falls which occurred in many places in November when the wheat was ripe, and which did the crops more or less injury, while adding nothing to the yield.

TABLE II.—Showing relation of Average Yields to Total Rainfall during Periods of Fallow and Growth respectively, Western District, 1914.

Locality.	Total Rainfall during—			General Average Yield.
	Period of Fallow.	Total Growing Period.	Growing Period, late-sown Wheat.	
	inches.	inches.	inches.	bus. lb.
Wellington	11·16	6·48	4·48	22 49
Gilgandra	11·92	4 76	2·87	21 46
Armatree	11·22	2·24	......	17 13
Dubbo	15·45	5·77	......	16 35
Coorawong	13·17	4·09	......	15 56
Parkes	10·72	4·50	3·40	13 24
Manildra	10·41	5·43	......	11 57
Grenfell	11·16	4·56	......	10 37
Brundah	13·15	4 73	......	9 42
Mungeribar	6·50	5·00	......	6 41
Forbes	7·92	3·16	......	6 37
Nelungaloo	8·12	4·18	2·63	6 21
Botfields	7·97	3·67	......	4 12
Wyanga	7·67	4·43	3·87	3 25
Ootha	8·72	2·56	......	2 51
Tullamore	7·51	5·44	......	2 11

With reference to the average yields, it will be seen that a sharp distinction can be drawn between the first nine plots (three-bag returns and over, *i.e.*, payable crops), and the last seven (about two bags and under, *i.e.*, crops which entailed financial loss). It will also be noticed that the latter seven plots were situated in the drought-stricken country above referred to.

In passing now to the consideration of the seasonal conditions in the more favoured parts of the district, namely, the country lying about Gilgandra, Dubbo, Wellington, Molong, Parkes, and Grenfell, it is apparent from Table II that the difference lies more in the amount of rain received prior to seeding than in the rainfall during growth. Certainly the latter was slightly more favourable on the whole, and especially in certain restricted areas. Storms seemed to follow one another along definite courses to an unusual extent this year, thus producing a marked variation in seasonal characteristics within the space of a few miles. Autumn conditions were generally very good; in some places almost ideal. Thoroughly satisfactory germination and early growth resulted, and the latter continued until the middle or end of July. After the first few days of that month, however, practically the whole of the district shared with the south the dry spell extending to the middle of September. The rains which then fell were slightly heavier and more general, and it is due in part to special favours at about this time that the excellent returns at Wellington and Gilgandra were reaped.

Moderate falls followed throughout in October, and these sufficed to ripen off the later crops. The earlier ones were then already in process of ripening, and harvest was, in consequence, exceptionally early—by four or even six weeks as compared with last season.

The Success of Fallowing.

In spite of the slightly better conditions during growth indicated above, it cannot be claimed that the heavier returns obtained in these parts of the district are due in more than a very small part to this cause. In fact, the lowest rainfall during growth recorded, 2·24 inches, was at the Armatree plot, which stands third on the list of average returns. The explanation of these distinctly higher yields must be the greater total fallow rains received in these localities, as shown in the table, and in this fact lies a very complete vindication of the claims which have been made with regard to fallowing as a precaution against drought, in spite of apparent failures in other districts. Convincing proofs of the value of the practice were to be met with on the majority of private farms throughout the district this year, but nowhere were they so marked as in the Gilgandra district. Here the bulk of the fallow rains occurred shortly before seeding, in February and March, and the winter rains were relatively light. Thus only land which had been broken prior to or during January was able to turn the season's rainfall to good account, and land so treated for the most part carried excellent crops. On adjoining paddocks which were, however, not ploughed until April or later, the crop was poor, and in some cases scarcely worth reaping. It must be admitted, of course, that crops on such late-ploughed land carried the additional handicap of being sown later—a particularly heavy one as it proved this year. This, however, generally speaking, must be the fate of most crops sown on land which has not been thoroughly prepared before the approach of seeding time.

In order to arrive at an estimate of the actual value of fallowing under ordinary farm conditions, a number of tests were arranged on the following plan. One section of ground, about three quarters of an acre, was left unfallowed. This was broken a few weeks prior to seeding and planted with one of the wheats included in the ordinary variety trial on the fallow. The respective yields from fallowed and unfallowed land thus obtained in the several localities are tabulated below.

TABLE III.—Showing Results of Fallow Tests, Western District, 1914.

Locality.	Variety.	Yield from Fallowed Land.		Yield from Unfallowed Land.	
		bus.	lb.	bus.	lb.
Gilgandra	Marshall's No. 3	30	5	22	52
Parkes	Rymer	19	19	10	14
Brundah	Bomen	11	6	0	48
Nelungaloo	Bomen	5	55	0	50
Ootha	Rymer	3	32	1	28
Wyanga	Rymer	1	45	1	21
	Average	11	57	6	16

Average difference in favour of Fallow, 5 bus. 41 lb.
Value of difference at 5s. per bus., £1 8s. 4d.

It will be seen that where the fallow received anything approaching a sufficient rainfall (at Gilgandra, Brundah, and Parkes) the difference represents a far greater monetary value than that of all the extra work and other expense involved in the preparation of the fallow. At Nelungaloo and Ootha the extra returns still represent a profit. At Wyanga the failure is due, as explained above, partly to the insufficiency of the fallow rains and partly to the almost complete burning off of all forward crops in this locality during the hot early spring following a dry winter and a favourable, forcing autumn.

Variety Trials.

The testing of the suitability of different varieties under different conditions occupied the greater part of the area of the plots and the yields obtained from each in the several localities are shown in Table IV. As in other reports, no attempt is made to calculate out average yields. A general review indicates that the first four places of merit are occupied by relatively late wheats, as was the case in the previous season. This is due in part to a certain similarity in the characters of the two seasons. The exceptionally early and severe spring this year again had the effect of ripening, or at least burning off the earlier wheats prematurely, so that when the September rains arrived, these wheats could not take full advantage thereof for further growth, and were in some cases quite beyond recovery. The later wheats, however, especially those possessed of the power of drought-resistance to a certain degree, retained more vitality and were able to make a considerable recovery in September and in most cases were also able to take advantage of the October rains. The results here recorded then, like those of last year, tend to put the later wheats in an unduly high position in respect of relative yielding capacity—a position which they are not likely to retain in an average run of years.

TABLE IV.—Showing Results of Variety Trials. Western District, 1914.

(*a*) Standard Varieties.

Locality.	Marshall's No. 3.	Yandilla King.	Bomen.	Rymer.	Warren.	Federation.	Florence.	Bunyip.	Comeback.	Thew.	Firbank.
	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Wellington	31 54	23 34	30 11	....	....	21 14	14 7	....	13 48	...	14 29
Gilgandra	30 5	...	25 20	28 20	24 19	25 16	....	16 40	....	15 27	....
Armatree	19 28	20 46	....	18 7	....	17 57	....	18 22	14 13	....	12 33
Dubbo	22 51	....	....	16 1	....	15 20	15 0	18 10	12 6	....	....
Coorawong	....	17 13	....	16 19	19 3	13 19	18 46	12 49	18 27	....	11 30
Parkes	....	....	16 27	19 19	12 2	17 35	....	10 23	....	....	7 7
Manildra	16 20	12 53	12 20	13 7	....	11 53	....	....	....	9 44	7 24
Grenfell	15 7	12 43	11 43	....	....	8 53	....	8 45	....	....	7 18
Brundah	12 15	....	11 6	10 12	....	10 0	....	4 24	....	....	....
Mungeribar	....	10 14	9 33	7 34	8 24	6 5	....	5 40	4 34	....	1 22
Forbes	6 47	10 9	7 18	7 11	....	5 14	....	3 35	....	....	2 33
Nelungaloo	....	7 4	5 55	6 46	6 58	5 5	....	7 31	....	6 0	....
Botfields	6 8	5 15	4 28	5 10	....	3 12	2 18	....	....	3 10	....
Wyanga	1 20	....	....	1 45	2 3	1 11	4 32	6 0	....	....	5 8
Ootha..	4 44	....	....	3 32	....	2 25	1 40	3 0	1 38	1 50	2 3
Tullamore	2 52	....	....	1 54	0 50	2 10	....	1 42	....	3 10	1 16

TABLE IV.—Showing Results of Various Trials. Western District, 1914—*ctd.*

(*b*) Unclassified Varieties.

Locality.	Bobs.	Commonwealth.	Cedar.	Canberra.	Sunset.	Dart's Imperial.	Marquis.	Pavey's Purple Straw.	Nash's White.	Gold Top.	Turvey's Purple Straw.
	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Wellington	....	26 11	21 17	....	....	31 20	....	....	....	....	....
Gilgandra	....	....	....	16 21	11 51	....	24 1	....	....	....	....
Armatree	....	16 23	....	....	....	....	....	....	....	....	....
Parkes	....	....	16 54	....	7 27	....	....	....	....	....	....
Grenfell	9 53	....	....	....	....	....	....	....	....	....	....
Brundah	....	....	10 12	....	....	....	....	....	....	....	....
Forbes	....	....	....	....	....	....	....	8 26	....	....	8 17
Nelungaloo	....	5 30	....	7 51	6 20	....	....	....	4 50	....	....
Botfield	3 58	....	....	....	....	....	....	....	....	....	....
Wyanga	5 21	....	....	....	....	....	....	....	....	....	....
Ootha	....	....	....	....	....	....	....	....	....	4 48	....

Below are appended notes on the behaviour of individual varieties in cases in which such seem called for.

Standard Varieties.

Marshall's No. 3.—The feature of the trials has been the very general superiority of this variety in both grain and hay returns and under comparatively favourable conditions as well as under those of severe drought. There is little doubt as to its being the most successful wheat grown on the plots in this district.

Yandilla King is little inferior to Marshall's No 3 as is indicated by the Table. It is more generally grown by farmers than the latter and has this year enhanced its very favourable reputation as a drought-resister, that is, a wheat which, during an early dry spell, though making little or no growth, is pre-eminently able to retain its vigour without either burning off or tending to " spindle up " prematurely into head growth.

Bomen under relatively favourable conditions has done well. In several localities, however, it created a rather poor impression by its irregular and spindly early growth and poor colour. The ears also were more tipped by the dry weather than was the case with other varieties.

Rymer and *Warren* have again both made a good showing, and their relatively high positions on the list give a fairly accurate indication of their performances this year.

Federation again occupies a comparatively low position, and disappointment with this variety has been more general amongst farmers this year. Its failure has been attributed to various causes—frequently to the effects of frost—but no authentic cases of this trouble were noticeable, at least as far as the plots were concerned. The sufficient explanation seems to be that it was neither quick enough in growth to mature with the sole aid of the June and early July rains, as some of the very early wheats managed to do, nor

sufficiently late to enable it to retain its vigour of growth over September, and it was thus prevented from making a thorough recovery after the rains which fell in that month.

Florence and *Bunyip.*—As explained above, a number of circumstances combined to handicap all the early wheats. These two have withstood the trying conditions better than the others: Florence has shown up to advantage as a hay wheat as well as a grain yielder, while Bunyip has to a certain extent regained its reputation, after getting into general disfavour last year.

Firbank suffered most from the effects of the dry winter, and went off in a disappointing way throughout.

Unclassified Varieties.

Bobs.—Though this wheat turned out fairly well considering the conditions at the three localities where it was included, yet its high yields are quite chance results. It had a restricted trial, and the yields give no reliable indication of the capabilities of the variety.

Commonwealth, on its first trial in the plots, has done well. It has had however, during this season certain advantages depending on its comparatively late maturity, but was, nevertheless, outclassed by the old standard late wheats.

Canberra, like Sunset, is a recently introduced wheat undergoing trial in the plots. The former yielded comparatively well under adverse conditions and produced a good impression in both localities at which it was grown.

Sunset.—Promised well during the first half of the growing season. It came away remarkably quickly, ran up into ear early in September, and before the rains occurred it had already set a fair crop of grain, which, no doubt, would have matured without the aid of these showers. At about this time Bunyip, under the same conditions, was about twelve to fourteen days later, and the heads had not begun to show up. A considerable amount of rough weather then occurred, when the heads were at their heaviest. At Parkes and Nelungaloo, especially, the straw was by no means equal to this strain. Later, also, the grain shelled out considerably, and in spite of its extreme early maturity, the wheat could not be considered a success, except for far western conditions, where rapidity of growth is a great desideratum.

Manurial Trials.

The trials of manure were made more or less extensive to suit local conditions. Thus, in the higher parts of the district, where it was thought possibly basic slag and a bonedust-superphosphate mixture might prove satisfactory, these were both included, together with three plots dressed with different quantities of superphosphate alone. Farther west, two plots only were planted, with 84 and 56 lb. superphosphate respectively, while in the country north of Dubbo, where the soil has the reputation of not responding appreciably to manure, the trial was restricted to a single plot. In each case a check plot was sown without manure. The results are set out in Table V.

TABLE V.—Showing Results of Manurial Trials for Grain. Western District, 1914.

Locality.	Variety.	No Manure.	Superphosphate. 84 lb.	Superphosphate. 56 lb.	Superphosphate. 37 lb.	37 lb. Super. and 19 lb. Bonedust.	56 lb. Basic Slag.
		bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Wellington ...	Marshall's No. 3...	23 17	33 10	31 54	27 15	25 12	28 13
Manildra ...	Marshall's No. 3...	11 40	16 42	16 20	14 20	14 53	12 51
Grenfell ...	Federation ...	5 54	9 20	8 53	7 45	6 14	6 0
Brundah ...	Federation ...	8 27	10 31	10 0	9 26	10 23	9 36
Forbes ...	Federation ...	6 4	5 34	5 14	6 4	6 11	5 41
Dubbo ...	Rymer ...	12 29	15 8	16 1	...	...	...
Parkes ...	Federation ...	15 22	18 50	17 35	...	...	...
Mungeribar ...	Federation ..	6 18	5 32	6 5	...	...	...
Nelungaloo ...	Rymer ...	6 37	6 34	6 46	...	...	...
Botfields ...	Rymer ...	3 35	6 19	5 10	...	...	...
Wyanga ...	Marshall's No. 3...	2 13	1 39	1 20	...	...	...
Tullamore...	Federation ..	1 26	1 58	2 10	...	...	...
Ootha ...	Firbank ...	1 52	2 3	2 3	...	...	...
Gilgandra ...	Rymer ...	28 6	...	28 20	...	...	...
Armatree ...	Yandilla King ...	20 37	...	20 46	...	...	...
Coorawong ...	Federation ...	13 7	...	13 19	...	...	...

No very definite conclusions can be drawn as to the relative values of the dressings employed, owing to the extraordinary nature of the season. However, the belief that superphosphate is of little or no value at Gilgandra and northwards appears to be thoroughly confirmed. In the country extending from Dubbo southwards its effects were more or less conditional upon the available supply of moisture. Where there was a sufficient total rainfall to ensure a fair crop all applications of superphosphate returned a handsome profit in the shape of increased yields, especially so at Wellington. In places, however, where the drought was more severe, the manure had either no effect at all or that of slightly reducing the yields. Here, again, an exception occurs in the Bogan Gate district (Botfields and Ootha). Conditions in this neighbourhood appear to approximate to those of the Western Riverina as opposed to the almost sub-tropical climate of the north-west. Correspondingly, a general increased yield resulted from the use of superphosphate in these localities, notwithstanding the extremely dry conditions.

With reference to the bonedust-superphosphate mixture and the basic slag, all that can be said is that this year their beneficial effects, though perceptible, were not equal to that of a dressing of 37 lb. of superphosphate.

Rate of Seeding Trial.

These gave results which were only to be expected in so dry a season. At one or two localities only did the heavier seeding result in an increased yield. Generally speaking, the moisture supply was insufficient to support the denser crop, and the light seeding, in consequence, gave the best return. These results, however, which, like those of the manure trials, are so obviously influenced by the unusual severity of the season, cannot be taken too literally as a guide for future practice.

TABLE VI.—Showing Results of Rate of Seeding Trials for Grain. Western District, 1914.

Locality.	Variety.	Light Seeding, 30-35 lb. per acre.		Medium Seeding, 45-50 lb. per acre.		Heavy Seeding, 60-65 lb. per acre.	
		bus.	lb.	bus.	lb.	bus.	lb.
Wellington	Bomen	28	6	30	11	31	7
Gilgandra	Federation	25	31	25	16	25	0
Armatree	Firbank...	13	35	12	33	11	40
Dubbo	Federation	14	25	15	20	15	8
Coorawong	Bunyip	16	40	12	49	10	39
Manildra	Federation	11	40	11	53	9	18
Grenfell	Bunyip	10	43	8	45	9	10
Mungeribar	Yandilla King	13	5	10	14	9	9
Forbes	Yandilla King... ...	10	9	10	9	6	43
Nelungaloo	Bunyip	7	45	7	31	6	22
Botfields	Federation	2	40	3	12	2	48
Wyanga	Federation	1	13	1	11	1	7
Ootha	Federation	3	13	2	25	2	7
Tullamore	Firbank	1	26	1	16	1	18
	Averages	11	27	10	55	10	20

Trial of Oats for Hay and Grain.

As an adjunct to the wheat experiments, a few varieties of oats were planted in certain localities, and the yields obtained therefrom are set out in Table VII.

TABLE VII.—Showing Returns of Hay and Grain from Trials of Oats. Western District, 1914.

Locality.	Algerian. Hay.	Algerian. Grain.	Sunrise. Hay.	Sunrise. Grain.	Cape. Hay.	Cape. Grain.	Red Rust-proof. Hay.	Red Rust-proof. Grain.
	t. c. q.	bus. lb.	t. c. q.	bus. lb.	t. c. q.	bus. lb.		bus. lb.
Wellington	2 6 1	40 5	...	17 34	...	...	...	27 33
Nelungaloo	...	10 14	...	23 14	...	...	...	...
Dubbo	1 10 0	24 19	1 14 1	22 12	1 12 0	17 18	...	...

The above plots were all manured with 56 lb. superphosphate per acre.

Algerian maintained its superiority in relatively favourable circum stances at Wellington and Dubbo. At Nelungaloo, however, under conditions of severe drought, Sunrise (a new variety on its first trial in the plots) proved by far the better oat, both as regards grain return and apparent hay-yielding capacity. The difference was most marked during late September. Sunrise had then made good growth, and stood up to 3 feet 6 inches in height, a good crop of grain was setting, and the straw was turning colour in a thoroughly healthy manner. Algerian, at the same time, looked very poorly indeed; it was for the most part badly burnt off, and what few heads were forming stood from 1 foot to 18 inches high and were badly tipped. A fair recovery was made after the October rains. By this time, however, the crop of Sunrise was fit to strip.

It may be pointed out that Sunrise oats, at Dubbo, though returning a lower grain yield than Algerian (owing to the recovery of the latter with the late rains), still cut considerably more hay, owing to its having made more rapid and stronger growth during the early part of the season.

Wheat Variety Trials for Hay.

In three localities parts of each section of the plots were cut for hay in order to allow more room for working the harvesters. This hay was weighed, and although it was not part of the original plan to conduct hay trials, a few of the results recorded bring out points of interest, and these are tabulated below.

TABLE VIII.—Showing Hay Returns from Variety Trial. Western District, 1914.

Variety.	Wellington.	Dubbo.	Forbes.
	t. c. q.	t. c. q.	t. c. q.
Marshall's No. 3	2 16 3	1 15 3	0 14 2
Federation	2 11 2	1 8 3	0 6 1
Yandilla King	2 3 0	....	0 13 3
Bomen	2 8 1	....	0 11 0
Commonwealth	2 5 2	....	....
Cedar...	2 10 2	....	....
Dart's Imperial	2 4 0	....	....
Rymer	....	1 6 1	0 12 3
Florence	....	1 12 3	....
Firbank	....	....	0 7 0
Bunyip	....	1 10 1	0 5 0
Comeback	....	1 9 0	....
Turvey's Purple Straw	....	....	0 7 3
Pavey's Purple Straw	....	....	0 10 3

Marshall's No. 3 again holds pride of place under the two extremes of conditions experienced, namely, those prevailing at Wellington and at Forbes respectively.

Federation gave an excellent return at Wellington, and this in spite of the fact that the other varieties, which gave inferior yields, stood from 1 foot to 18 inches taller.

Seeding and Manurial Trials with Wheat for Hay.

Both manuring and heavy seeding proved good practice for hay-growing at Wellington and Dubbo, but under drought conditions at Forbes neither were, of course, of any benefit.

TABLE IX.—Showing Returns from Seeding and Manurial Trials for Hay, Western District, 1914.

(*a*) Seeding Trials.

Locality.	Variety.	Seed per acre. 35 lb.	50 lb.	65 lb.
		t. c. q.	t. c. q.	t. c. q.
Wellington	Bomen	2 6 3	2 8 1	2 8 3
Forbes	Yandilla King	0 11 3	0 13 3	0 11 2
Dubbo	Federation	1 8 2	1 8 3	1 10 1

TABLE IX.—Showing Returns from Seeding and Manurial Trials for Hay, Western District, 1914—*continued.*

(*b*) Manurial Trials.

Variety.	Wellington.			Forbes.			Dubbo.		
	Marshall's No. 3.			Federation.			Rymer.		
	t.	c.	q.	t.	c.	q.	t.	c.	q.
Superphosphate, 37 lb.	2	6	1	0	7	2	....		
,, 56 lb.	2	16	3	0	6	1	1	6	1
,, 84 lb.	2	12	2	0	7	1	1	8	1
No manure	1	11	3	0	6	1	1	2	2
Basic Slag, 56 lb.	2	3	1	0	5	2	....		
Superphosphate, 37 lb; bone-dust, 19lb.	2	5	0	0	5	3	....		

WESTERN DISTRICT.

MUDGEE-COONABARABRAN LINE.

J. W. SHAW, Assistant Inspector of Agriculture.

DURING the 1914 season wheat experiments were conducted at three different centres along this line. The names and addresses of the farmers who offered suitable sites for this purpose, and who agreed to co-operate with the Department, were as follow :—

Mr. J. S. Carter, "Enfield," Mudgee.

Mr. F. S. Stacy, "Cumbandry," Gulgong.

Messrs. Greenhalgh Bros., "Pinegrove," Mundooran.

At Mudgee and Gulgong the experiments were confined to a trial of different varieties and a manurial test, while at Mundooran a trial of different varieties and a seeding test comprised the experiment.

As the quantity of superphosphate which should be applied per acre under New South Wales conditions still appears to be in doubt, the manurial experiment consisted mainly of a trial of varying quantities (which would be likely to cover the range which most farmers use), and also a test with basic slag (Thomas' phosphate) and a mixture known as W3, which contains superphosphate and bone-dust. The plots were sown in the following order :—

56 lb. Superphosphate.

No manure.

37 lb. Superphosphate.

84 lb. Superphosphate.

56 lb. Basic Slag (Thomas' Phosphate).

56 lb. W3 mixture (37 lb. superphosphate and 19 lb. bone-dust).

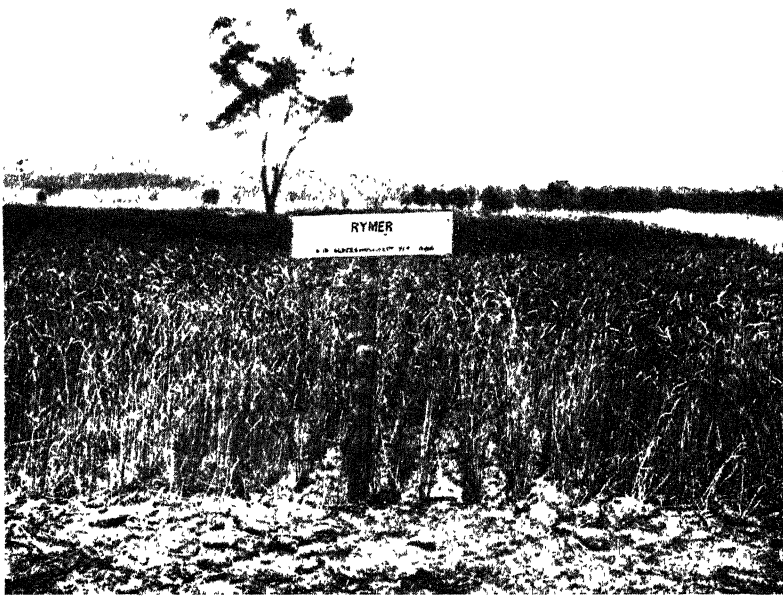
At Mudgee, Federation was the variety chosen for the manurial test, while at Gulgong, Rymer was used. Marshall's No. 3 was chosen for the seeding test at Mundooran, three plots being sown at the following rates per acre:—35, 50, and 65 lb. respectively.

The quantity of seed per acre is a much discussed question amongst wheat growers, and depends upon quite a number of different factors—such as variety, time of sowing, &c.; still, the quantities tested in the experiments practically cover the wide range which are commonly used in this State.

Features of the Season.

Although the season throughout the greater portion of the wheat belt was one of the worst in history, such was not the case in the districts under review. The autumn, generally speaking, was a very favourable one, good rains being recorded at each centre, and as a result, the seed beds were in splendid condition for sowing. Although this was carried out much later than was originally intended, germination was quick, due, no doubt, to the extremely mild weather conditions which prevailed at that time. The months of June and July were very favourable to growth, good rains being recorded at each centre, and the weather conditions being unusually mild for that period of the year. August, which is one of the most critical months during the growing period, proved very dry, particularly at Gulgong and Mundooran, no rain being recorded, while at Mudgee only 15 points were registered. Owing to the fact that all the plots were planted on land that had been well fallowed, the dry weather during August did not seriously affect the plots; but crops that were not sown on fallowed land did not present a very healthy appearance, and some farmers began to doubt the prospects of even a hay harvest. Fortunately, September proved very favourable, particularly at Mudgee, where 333 points were received. This fall ensured a splendid hay harvest, and the prospects of a fair grain return from the earlier maturing varieties presented themselves. At Gulgong 130 points were registered during September, and at Mundooran 140; and as a result, the crops made wonderful headway. Unfortunately, October proved very unfavourable, particularly at Gulgong and Mundooran—no rain being recorded at the former, and only 20 points at the latter. This prevented the wheat from filling well, and as a result the crops, particularly those that had been sown late and were on unfallowed land, were disappointing. Fortunately, at Mudgee 189 points were recorded in October, while fairly good rains were received early in November, but this was too late to be of much benefit to the crops.

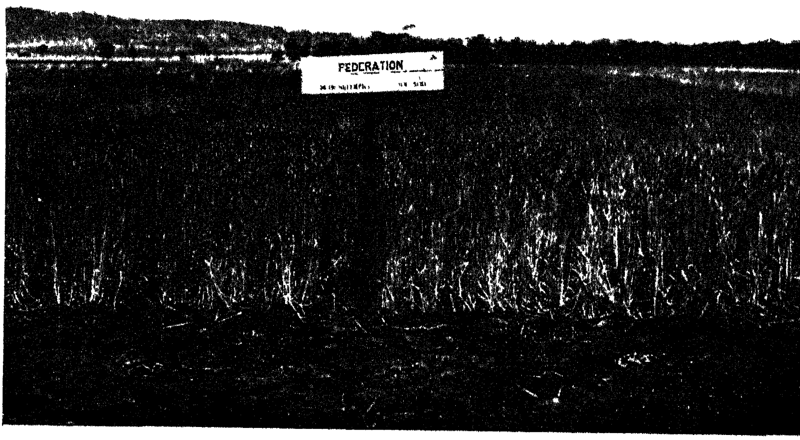
Summing up the season, it can be said that the Mudgee district experienced a splendid season, from a wheat-growing point of view, and practically every farmer who sowed reasonably early obtained excellent returns. At Gulgong and Mundooran the season could not be classed as a very favourable one—in fact it was decidedly unfavourable—but any farmer whose crops were on land that had been even summer-fallowed, and sown fairly early, harvested fair crops. The most critical month, October, was the drawback, and had good rains been received, some very high yields would have been obtained.



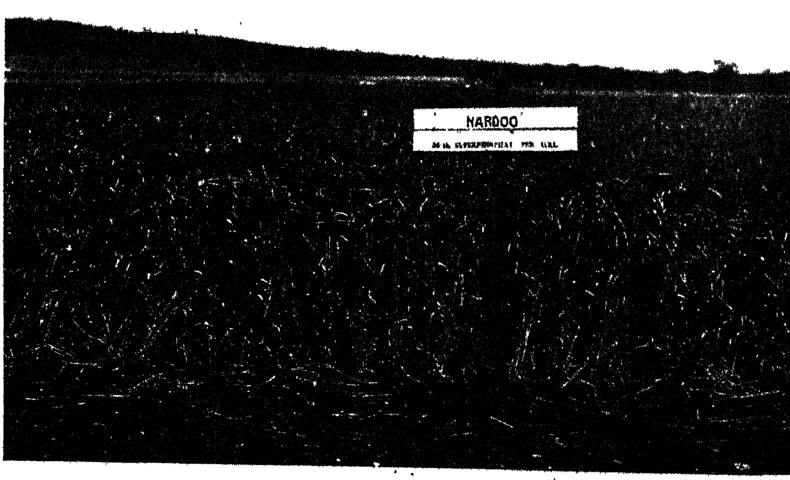
Rymer Wheat at Gulgong.
Manured with 56 lb. superphosphate. Yield per acre = 18 bushels 8 lb.

Rymer Wheat at Gulgong.
Unmanured. Yield per acre = 11 bushels 36 lb.
Difference due to manure, 6 bushels 32 lb., or 56 per cent.

FARMERS' EXPERIMENT PLOTS.



Federation Wheat at Gulgong.
Manured with 56 lb. superphosphate per acre. Yield per acre = 22 bushels 30 lb.



Nardoo Wheat at Gulgong.
Manured with 56 lb. superphosphate per acre. Yield per acre = 18 bushels 28 lb.

FARMERS' EXPERIMENT PLOTS

Early *v.* Late Sowing.

From time to time a good deal has appeared in the *Gazette* on this subject, but there are still a number of farmers who do not seem to realise its importance. In the districts under review it is not an uncommon practice to see farmers sowing in July, and cases have come under notice where sowing has been done as late as the first week in August. Such a practice cannot be too strongly condemned, for in nine seasons out of ten its results are fatal, as the crop does not yield a payable return. Early-sown wheat, when drilled into a well-prepared, moist seed-bed, will germinate in less than a week, whereas wheat sown in July will not appear above ground for probably three weeks, unless the weather conditions are unusually mild. The delay in germination is due to the coldness of the ground and atmosphere. When wheat sown in July does appear above ground, growth is practically at a standstill—unless the winter is a very mild one—until the warm spring weather sets in. Another disadvantage of late-sown wheat is that it does not get a good root hold, and also that the winter rains cause water-logging, and as a result, the land gets hard and crusted on the surface—a condition unsatisfactory for the growth of any crop.

The advantages of early sowing are that the wheat soon covers he surface of the ground, which prevents it getting out of condition by heavy rains; it stools better; and also it is enabled to get a good root hold, which enables it to better withstand dry spells which are very frequently experienced throughout the growing season. It must be distinctly understood that the season of the variety must be considered when deciding the time to commence seeding operations. Negligence in this direction may result in even greater losses than very late sowing. In the districts under review every endeavour should be made to commence sowing the late maturing varieties, like Cleveland, on the 1st of April. In fact, the last week in March is not too early with such varieties if a farmer runs sheep, and can feed off his crops if the season prove a very favourable one, and the wheat has a tendency to become too forward. The planting should be completed by the middle of June, and all land that cannot be sown between the last week in March and the second week in June should be ploughed and allowed to fallow for the following year.

Cultivation Methods.

The practice of only using fallowed land for the experiments was rigidly enforced when selecting sites for the plots. In two cases the land had been winter-fallowed, and in the other the land had previously borne a crop of hay, but was ploughed immediately after the hay was harvested, about the beginning of December, and a thorough preparation given. The Mundooran plot, which received this treatment, was not sown until the end of May, so that the land had lain fallow for quite six months prior to planting. The results obtained at each centre are convincing evidence of the value of fallowing, but in order to point out the advantages of this operation on more comparative lines, arrangements have been made to conduct fallow and non-fallow trials during the coming season.

The most striking feature about the crops seen in the districts under review during the past season was the noticeable difference between crops sown on fallowed land and those growing on land that had been prepared just prior to sowing. In practically no cases were crops to be seen growing on land that had been winter-fallowed, but the difference between those growing on land that had been prepared immediately after harvest, and which had the benefit of two or three months' fallow, was most marked. It is not so much during the early stages that the effect of fallowing becomes apparent; it is during the dry spells which usually occur during the early spring months that the wisdom of this operation can be noticed. It is extremely difficult to state reasons why so few farmers along this line fallow their land, when the benefits to be derived are so well known. In a few cases farmers are fallowing, perhaps, one or two paddocks each year, for the purpose of cleaning the land of black oats, which, by constant cropping, have become so bad that they find it almost impossible to grow wheat in them successfully. Apart from its value in conserving moisture and cleaning the land of oats, thistles, &c., it has the great advantage that land lying fallow is workable at all times, and no matter how dry the season may be between harvest and planting time, the farmer can commence sowing whenever he pleases. This is not always the case with unfallowed land, as the weather conditions, after the harvest until planting time, may prove so dry that ploughing is almost an impossibility, owing to the hard condition of the ground. The farmer who never fallows does not know exactly how much crop he will be able to put in, hence another advantage of this operation is that it enables a farmer to state exactly what area he will crop each year.

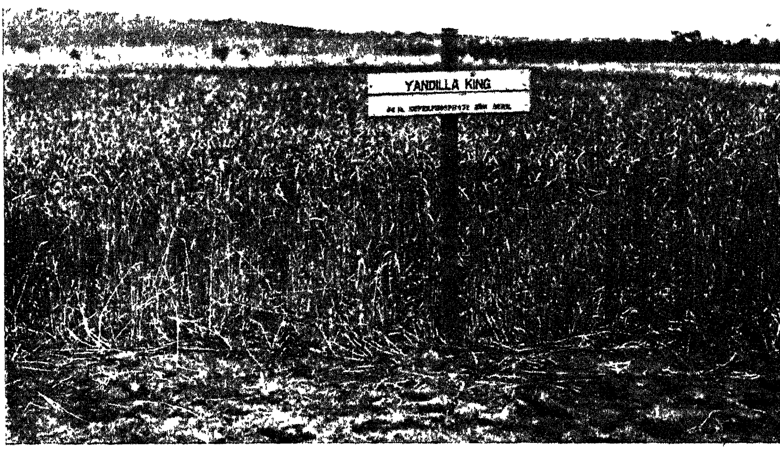
The wheat-farmer who is dependent upon a favourable autumn to commence his cultural operations is taking a tremendous risk, and if favourable rains are not received until late in the season, as in 1912, the preparation of the land is delayed, and seeding is also delayed, with the result that the crops are sown too late to return payable yields in the majority of seasons.

The farmer who tries to grow wheat in the same paddocks year after year, without fallowing, is trying to do something that has been proved to be practically impossible, and the time is not far distant when such farmers will find fallowing to be a compulsory operation in order to keep black oats thistles, &c., in check, if for no other of the reasons explained above.

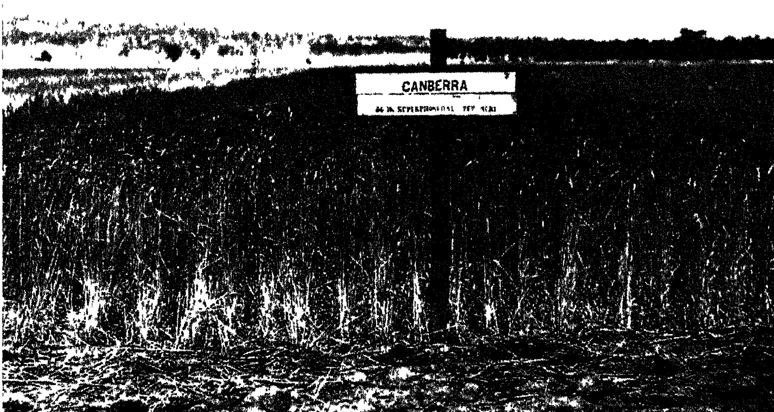
Comments on Varieties.

A few remarks on the behaviour of the different varieties may prove helpful to farmers in making their choice this season.

Federation.—This popular and well-known variety holds pride of place as regards yield, despite the fact that many farmers are of the opinion it is fast losing its high-yielding qualities. Its short, strong straw enables it to stand the storms which were frequent during harvest, whereas other varieties lodged rather badly, and thus increased the difficulty of harvesting. Most farmers usually pin their faith to a certain variety for their main sowings, and it is safe to assert that there is no safer and better yielding variety than Federation for this purpose.



Yandilla King Wheat at Gulgong.
Yield per acre=21 bushels 18 lb.



Canberra Wheat at Gulgong.
Yield per acre=24 bushels 52 lb.

FARMERS' EXPERIMENT PLOTS.

Federation Wheat at Mudgee.
Manured with 84 lb. superphosphate per acre. Yield per acre=34 bushels.

Bomen Wheat at Mudgee.
Manured with 56 lb. superphosphate per acre. Yield per acre=32 bushels 26 lb.

FARMERS' EXPERIMENT PLOTS.

Although hundreds of acres were fit to strip when heavy thunderstorms were experienced, the crops were not damaged to any extent, except that the samples were rather badly bleached, due, no doubt, to the erect nature of the head. At Mudgee, where the season was a very favourable one, it yielded as high as 34 bushels per acre, at Gulgong 22 bushels, and at Mundooran 24 bushels.

Yandilla King.—This is one of the best dual-purpose wheats recommended by the Department, and appears to be becoming one of the most popular late varieties. It makes nice hay, and from the results of the past season, appears to stand droughty conditions extremely well. For the best results it should be sown early, preferably during the first three weeks in April.

Cleveland.—This variety has proved one of the most consistent yielders, both for hay and grain, along this line, and is strongly recommended as a good dual-purpose variety, suitable for early sowing. If Cleveland cannot be sown early in the season, the yields will be probably disappointing, as it is one of the very latest wheats recommended. It should always be sown on fallowed land, if possible, as, in consequence of its long growing season, it requires considerably more moisture than most other varieties to bring the crop to maturity.

Marshall's No. 3.—This variety has done remarkably well this season, and is strongly recommended as one of the best dual-purpose wheats. It is a profuse stooler, and requires early sowing for the best results.

Rymer.—This wheat, like Marshall's No. 3 and Yandilla King, is an excellent dual-purpose variety for early sowing. It does not appear to withstand droughty conditions as well as those above mentioned, and appears to be a little weak in the straw.

Bomen.—This is a comparatively new variety, which matures a little later than Federation, and has proved to be a very fair yielder. The straw grows to a fair height, is fairly strong, but it appears to have a slight tendency to shell. It does not appear to be a good drought-resister.

Warren.—This is a fair dual-purpose mid-season variety, and a great drought-resister. It has a rather weak straw, and on this account it is not advisable to sow in large areas.

Canberra.—This variety was tried on the farmers' experiment plots for the first time. It was produced by crossing Federation with a barley which came from Russia as an impurity known as Volga. Unfortunately, sufficient seed was only available to give this variety a trial at one plot, and comparing its yield with Federation grown in the same plot, it yielded 2 bushels more per acre. It appears to be slightly weak in the straw, but from the results obtained under by no means favourable conditions during the season just ended, it has given a good account of itself, and should prove a valuable addition to the early varieties recommended by the Department. It would be suitable for mid-season and late sowings.

Commonwealth.—This was also tried for the first time, it being a new variety which was bred at the Dookie Agricultural College in Victoria. I

is similar to Federation in many respects, having a brown ear with short straw, and last season matured in about the same time. It yielded fairly well, considering the season, but will be given a further trial this year.

Nardoo.—This is another variety which was tried for the first time in the plots, and gave promising results as a hay wheat. It is a fairly profuse stooler, with a moderate amount of flag, and the straw retains a good colour right to the ground. From the result of last year's trial, it appears to be of about the same season as Bobs, and promises to be a splendid hay variety, and a fair yielder of grain.

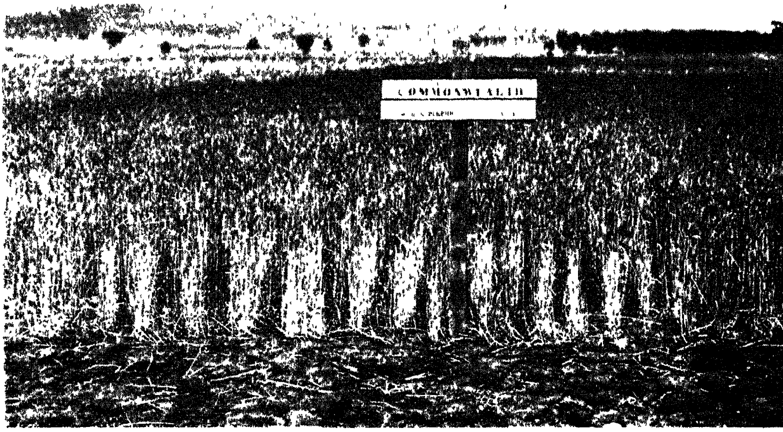
Manurial Trials.

As superphosphate has, up to the present, given the best results throughout the greater portion of the wheat belt, it was decided to confine the manurial trials chiefly to a test of varying quantities of superphosphate as compared with no manure, and also a trial of basic slag (Thomas' phosphate) and the mixture known as W3 (superphosphate and bone-dust). Up to the present time the Department has worked on 56 lb. as a standard, and this quantity was used in the variety trials. The other quantities of superphosphate tested were at the rate of 84 lb. and 37 lb. per acre, while the Thomas' phosphate and W3 mixture were also applied at the rate of 56 lb. per acre. The effect of all dressings, particularly the plots manured at the rate of 84 lb. per acre, was most marked on the young early growth, and in fact right up until harvesting time. The value of superphosphate in encouraging deep rooting, thereby enabling the plants to withstand droughty conditions better, cannot be disputed. At Mudgee the plots manured with 37 lb., 56 lb., 84 lb., as well as the plots manured at the rate of 56 lb. of W3, were all more vigorous than the plot manured with Thomas' phosphate, right through the growing period. No doubt the superphosphate in the W3 mixture was responsible for this difference in the growth. The plots at Mudgee and Gulgong, manured with 84 lb. of superphosphate, returned the heaviest yield, and in both instances the lowest dressing of superphosphate used, viz., 37 lb., returned higher yields than either the Thomas' phosphate or W3 mixture. From the results of the past season, there seems to be good reason to believe that the quantity of superphosphate at present worked on as a sort of standard, viz., 56 lb., can with advantage be increased. For the present, however, farmers are advised to adhere to the ½ cwt. until the results of further trials with heavier dressings are carried out.

General Summary.

From the results obtained during the past season on the plots, and the inspection of numbers of crops throughout the districts under review, the following points are worthy of serious consideration:—

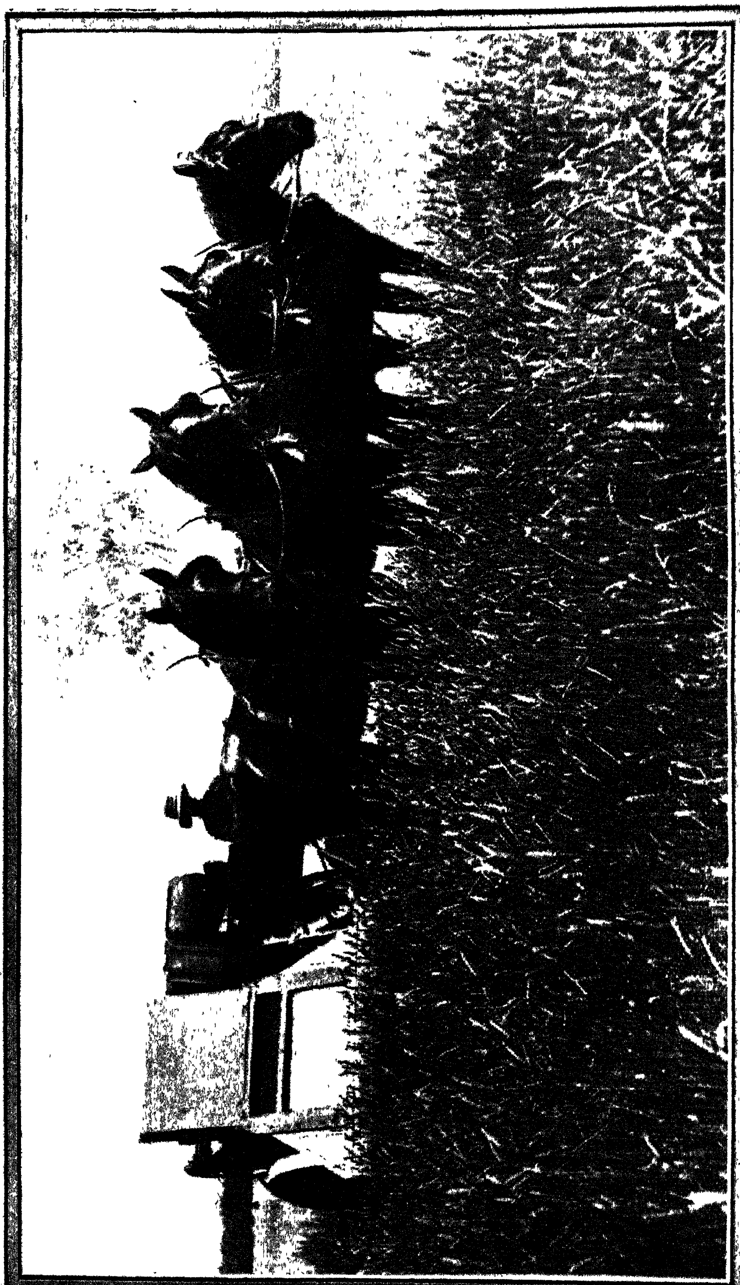
1. A definite area of the farm should be fallowed each season, and if this cannot be done in the winter, it should be carried out in the spring, or as early as possible before the planting season. If the land only lies fallow for one or two months, it is far preferable to ploughing and preparing the land immediately before sowing.



Commonwealth Wheat at Gulgong.
Yield per acre = 17 bushels 46 lb.

Rymer Wheat at Mudgee.
Yield per acre = 31 bushels 19 lb.

FARMERS' EXPERIMENT PLOTS.



The Harvester on a seven-bag (21-bushel) crop of Yandilla King at Gulgong.

FARMERS' EXPERIMENT PLOTS.

2. Each farmer should have a definite sowing period, and should aim at getting all his crops sown within that period.
3. The different varieties should be sown as early as is consistent with their period of maturity.
4. It appears to be advantageous to apply superphosphate in each of the districts under review, at a rate ranging from 40 to 56 lb. per acre.

TABLE I.—Showing the Results obtained from the Variety Trials, Mudgee-Coonabarabran Line, 1914.

Name and Address of Experimenter	J. S. Carter, "Enfield," Mudgee.	F. S. Stacy, "Cumbandry," Gulgong.	Greenhalgh Bros., "Pinegrove," Mundooran.
Rainfall during growth	11·18 inches.	6·55 inches.	6·56 inches.
Variety.	bus. lb.	bus. lb.	bus. lb.
Cleveland	29 47	14 20	15 36
Rymer	31 19	18 8	15 47
Bomen	32 16	19 22	....
Federation	29 18	22 30	24 27
Yandilla King	....	21 18	20 15
Marshall's No. 3	....	21 38	25 9
Warren	....	....	18 18
Commonwealth	....	17 46	19 49
Nardoo	....	18 28	....
Canberra	....	24 52	....

TABLE II.—Results of Seeding Trial at Mundooran.

Variety.	Seed sown per acre.	Yield per acre.
		bus. lb.
Marshall's No. 3	35 lb. seed	23 20
,, ,,	50 ,,	25 9
,, ,,	65 ,,	20 44

TABLE II.—Showing the Results of Manurial Trials, Mudgee-Coonabarabran Line, 1914.

Variety.	Manure Applied per acre.	J. S. Carter, "Enfield," Mudgee.	F. S. Stacy, "Cumbandry," Gulgong.	Greenhalgh Bros., "Pinegrove," Mundooran.
		bus. lb.	bus. lb.	bus. lb.
Federation	56 lb. superphosphate	29 18	......	24 27
,,	No manure	31 19	......	22 53
,,	37 lb. superphosphate	32 38	......	......
,,	84 ,, ,,	34 0	......	......
,,	56 lb. basic slag	30 10	......	......
,,	56 lb. W3 mixture	30 16	......	......
Rymer	56 lb. superphosphate	......	18 8	......
,,	No manure	......	11 36	......
,,	37 lb. superphosphate	......	16 12	......
,,	84 ,, ,,	......	19 16	......
,,	56 lb. basic slag	......	16 34	......
,,	56 lb. W3 mixture	......	17 36	......

The Proportion of Grain to Straw in Varieties of Wheat.

J. T. PRIDHAM, Plant Breeder.

IT is evident that varieties which convert a large percentage of their food material into grain are generally more profitable to the farmer than those which run largely to straw. Growers situated near a railway station often find that it pays to cut a large proportion of their crop for hay. For this purpose, however, a bulky crop is to be desired, provided that the straw is not too coarse.

It will be seen from the table given below that a good deal of difference exists between varieties in this respect. The figures given are for the past season only, and it must be borne in mind that varieties with a high migration ratio are not always the most productive of grain.

Farmers will be guided by their own experience, and by the results of farmers' experiment plots in their district in regard to yields per acre.

Mr. E. S. Beaven, who has been working in collaboration with Professor Biffen, of Cambridge, England, calls the ratio of grain produced to the total dry matter of the crop the "migration coefficient." Mr. Beaven's work has been in connection with barley, of which crop the straw is practically valueless. In the wheat belt, where harvesters and strippers are in universal use, the less straw a farmer has the better, provided that the crop stands up well enough and is sufficiently tall for the machines to do their work.

Single row plots 20 feet long were sown at intervals of 45 feet, each variety being planted in triplicate. The soil in section "C" was a greyish loam, gradually changing to a stiff reddish granitic soil in "F." It was found that a larger proportion of straw and leaf was formed by all varieties, as a rule, in "C" than in "D" and "F." Also the crop in "C" was more affected by frosts, drought, and take-all than in sections "D" and "F."

At harvest time the varieties were cut with a reaping hook, leaving a uniform length of stubble upon the ground. Each small sheaf was weighed separately, threshed, and the clean grain weighed and bagged. The ratio of the grain to the gross weight of each sheaf was worked out, and, for convenience, called the "migration ratio." The figures for Hard Federation are not reliable, and have been omitted—the ear of this wheat is less dense than that of Federation, and the migration ratio is

medium high. Hawkesbury No. 3 is a variety which grows taller than Thew, gives a greater bulk of fodder, and is a little earlier even than that variety. It is likely to be suitable for the coastal districts, but there is not yet enough seed for distribution.

On looking at the table, it will be seen that a few allowances should be made. The ratio of Zealand in section "F" should probably be higher, and the results for Moira are very uneven. Bunyip and Hawkesbury No. 3 suffered a good deal from take-all in section "C." Zealand stands out prominently as a hay wheat. The varieties which actually yielded most grain were Schultz' Purple Straw, Avoca, Gluyas' Early, selection from Comeback, and Yandilla King. The yields are not comparable, and have been omitted.

The cross Yandilla King x Indian was made in Victoria at the Longerenong College in 1909 and is not quite fixed. It ripens a little earlier than Federation and has good-sized ears, medium to short straw, and promises to yield well.

The rainfall for the year is given below. Practically all the plots were harvested before the 20th November, at which time only 78 points of rain had fallen for the month. The comparatively dry spring resulted in low ratios for section "C"—a free-working loam which yields a heavy crop in years of good rainfall:—

	Points.		Points.
January	124	July	190
February ...	38	August	5
March	237	September ...	118
April	244	October	131
May	118	November ...	304
June	62	December ...	292

Total, 18·63 inches.

Variety.	Migration Ratio.			
	For Plot 75 (J 3).	Plot 78 (J 3).	Plot 79 (J 3)	Average.
Federation	·42	·52	·50	·48
	Plot 82 (C 3).	Plot 55 (G 1).	Plot 58 (J 1).	
(Yandilla King x Indian)	·57	·60	·55	·57

Plot No.	Variety.	Migration Ratio.			
		Section "C."	Section "D."	Section "F."	Average.
15 (1)	Marshall's No. 3	·47	·52	·48	·49
19 (1)	Commonwealth	·51	·43	·45	·46
16 (1)	South Australian, 2474	·42	·46	·46	·44
22 (1)	Eclipse...	·36	·50	·45	·43
20 (3)	Cowra, No. 15...	·42	·44	·43	·43
20 (2)	Moira	·25	·61	·44	·43
17 (2)	Purple Straw	·42	·40	·45	·42
17 (3)	Yandilla King	·43	·41	41	·41
16 (3)	Rymer...	·40	·45	·39	·41
19 (3)	Currawa	·36	·44	·45	·41
14 (1)	Silver King	·40	·39	·42	·40
10 (3)	Gluyas' Early...	·41	·40	·41	·40
22 (3)	Jonathan	·42	·35	·43	·40
30 (1)	Thew	·33	·43	·44	·40
25 (2)	Farmer's Friend	·33	·43	·41	·39
14 (2)	Red Straw	·38	·43	·36	·39
21 (3)	American No. 8	·37	·40	·40	·39
30 (3)	Selection from Comeback	·44	·30	·35	·39
23 (3)	Avoca	·42	·37	·36	·38
21 (2)	Schultz' Purple Straw	·34	·42	·39	·38
31 (3)	Cedar	·37	·45	·33	·38
15 (2)	Hudson's Early Purple Straw ...	·37	·38	·40	·38
13 (1)	Cleveland	·32	·37	·42	·37
13 (2)	College Purple Straw	·37	·36	·40	·37
20 (1)	Bomen	·32	·38	·38	·36
21 (1)	Droophead	·32	·41	......	·36
12 (3)	Nardoo	·37	·35	·34	·35
15 (3)	John Brown	·34	·43	·30	·35
32 (1)	Bunyip...	·24	·41	·41	·35
12 (2)	Dart's Imperial	·31	·35	·37	·34
16 (2)	Lotz	·33	·33	·38	·34
29 (3)	Comeback	·34	·34	·32	·33
29 (1)	Warren	·37	·30	·32	·33
7 (3)	Huguenot	·36	·27	·29	·30
28 (1)	Hawkesbury No. 3	·23	·34	·30	·29
10 (2)	Australian Talavera	·30	·28	·28	·28
6 (2)	Zealand	·25	·27	·18	·23

The two wheats in the first table were sown from 20th to 27th May, while all the varieties in the second table were sown from 1st to 4th May.

SEED TESTING FOR FARMERS.

THE Department is prepared to test vegetable and farm crop seeds. Reports will be given stating the germination capabilities of the seed, its purity, and the nature of the impurities, if any.

Communications should be addressed to the Director, Botanic Gardens, Sydney. Not less than 1 ounce of small seeds such as lucerne, or 2 ounces of large seeds like peas, should be sent. Larger quantities are to be preferred. Seeds should be accompanied by any information available as to origin, where purchased, age, &c.

If a purity report only is desired, it should be so stated, to secure a prompt reply. Germination tests take from six to twenty days, according to the seed.

Failure of Wheat Seed to Germinate Normally.

G. P. DARNELL-SMITH, B.Sc., F.I.C., F.C.S., Biologist.

IT is a matter of common observation that the various parts of a plant have definite positions. If they are mechanically displaced, the usual position is often resumed after a time by curvature.

Every plant has some part where growth is either in progress or can be initiated; consequently if by appropriate mechanisms the amount or rate of growth can be modified locally, a curvature can be induced.

Practically all plants have such mechanisms, which are set in operation by various external stimuli. These curvatures in plants are called *tropic* curvatures, and are most conveniently considered according to the stimulus that induces the reaction.

"No force acts so constantly and so equally in all parts of the earth and in all situations as the force of gravity. It is perhaps the most general stimulus that acts upon plants. It is easy to observe that as soon as a plant stem that usually grows erect is overthrown curvatures occur in the younger parts that again direct the apex upwards, though the older parts are unable to erect themselves. Fallen trees and corn or other cereals beaten down by wind or rain offer many examples and suffice to demonstrate the main facts, namely, that gravity is the stimulus, and unequal growth the end reaction."*

The phenomena that produce these tropic curvatures are called *tropisms;* to these terms is often prefixed a word indicating the stimulus which calls forth the tropism, for example *geotropism* (ge, the earth - gravity).

The apices of young shoots and of young roots are particularly sensitive to the action of gravity. Young roots grow towards the centre of the earth and young shoots away from it; thus they are both influenced by gravity—or are *geotropic,* but in opposite directions. The young wheat seedling is no exception to the general rule; the rootlets normally grow towards the centre of the earth and the young shoot away from it.

Both last year and the year before cases came under the notice of the Department, on their own experimental plots and elsewhere, in which some of the wheat seed sown exhibited faulty growth, and instead of the shoot reaching the top of the soil it twisted about below the surface.

It was thought that this twisting was due either to faulty pickling or to the nature of the seed bed. Experiments were carried out by Mr. H. Stephens,

* Text-book of Botany: Coulter, Barnes and Cowles.

B.Sc., with untreated seed (Genoa) and with seed (Rymer) treated with bluestone and lime. From these experiments the following conclusions were drawn:—

1. When grown on porous plates between 80 and 90 per cent. of seed, either treated or untreated, germinated normally; the pickling therefore did not interfere with germination.
2. When planted 2 inches deep in loam, of untreated seed that germinated 5 per cent. was twisted; the twisting therefore is not due to the effects of "pickling."
3. One of the main causes of twisting is too deep sowing or a caked crust on the seed bed, as the following experiments show:—
   Seed planted ¾ inch deep in loam showed 2 per cent. twisted seedlings.
   Seed planted 2 inches deep in loam showed 18 per cent. twisted seedlings.
   Seed planted ½ inch deep in loam and then covered with 1 inch of a soil which set slightly on watering showed 25 per cent. of twisted seedlings.
   Seed planted 1½ inches deep in crushed sandstone which set slightly on watering showed 27 per cent. twisted seedlings.

These experiments serve to indicate that too deep planting or sowing the seed in soil which has a tendency to set are the chief factors in producing twisting, and emphasise the adage that "the proper preparation of the seed bed is the prime act of husbandry."

Nevertheless, some cases of twisting have been found which admit of no explanation on the above grounds. In these cases the shoot tip seems to have lost its usual property of reacting to the influence of gravity and of growing away from the earth. Even when planted in soil or sand in which no binding property or obstructions could be detected, the young stem shoot wandered about in the soil exhibiting no marked tendency to grow upwards. Whether certain seedlings have lost their power or react only feebly to the action of gravity, or whether a certain fungus (probably a *Podosporiella*) which we have found *within* the grain of some samples of wheat are contributing factors in the production of twisted seedlings, will be the subject of further investigation.

Factors in Successful Dairying.

The Man—Dairy minded; keen to learn, and attentive to details; active in co-operation; determined to win.

The Farm—Well organised; well stocked; well tilled.

The Cow—Dairy bred; well grown; properly fed; profitable.

The Product—Of superior quality; satisfactorily marketed.

The Market—Well established; carefully maintained.

C. G. Humphrey, Wisconsin Experiment Station.

Farmers' Experiment Plots.

NORTH COAST WINTER GREEN FODDER EXPERIMENTS, 1914.

G. MARKS, Inspector of Agriculture.

THE above experiments comprised a trial of four varieties of wheat and one of oats. Manurial trials with superphosphate were also conducted with Thew wheat and Algerian oats. The experiments were carried out on the following farms:—

J. Johnson, Condong, Tweed River.
R. E. Burton Bradley, Irvington.
J. Burling, Upper Orara.
H. B. Faviell, Bonville.
C. J. Rogers, Stuart's Point.
P. Secombe, Wauchope.
R. Richardson, Tinonee.
W. P. Reichert, Gloucester.

Hitherto Thew has proved itself the earliest, and Huguenot the heaviest yielder on the coast, and this season two new varieties were introduced. As is usual on the North Coast, during the autumn months, great difficulty was experienced in getting the land ready and the plantings made at the right time, on account of the heavy rains. Even after the land was prepared and the sowings effected, the heavy rains that set in at regular intervals throughout the period of growth, had the effect of consolidating the soil, and in a few instances portions of the plots were destroyed by floodings. As giving some idea of the amount of rain that fell between the periods of planting and harvesting, two cases may be cited:—

At Bonville, 39·87 inches were recorded.
At Upper Orara, 32·24 inches were recorded.

With such a tremendous rainfall, covering but a few months, it is only reasonable to expect that the effect would be detrimental to the crops, which in those particular localities were kept in a constant state of saturation for weeks at a time, and frequently flooded. At all the other plots, excepting Irvington, the rainfall during growth was far in excess of plant requirements, but the lie of the land provided good natural drainage, otherwise the plots would have suffered severely. With such a liberal rainfall and good drainage, it was only to be expected that good results would be obtained, though the coldness of the soil as the result of too frequent heavy rains made the growth somewhat slow during the early stages. In several cases the excessively tall growth, particularly in the

oats, caused lodging of the crop. The heaviest returns were obtained at Gloucester, where the plots were the earliest planted, and almost all the varieties were affected by lodging.

Owing to the entire absence of seed drills on the North Coast, excepting in a couple of localities, all the plots had to be broadcasted by hand, the seed used being at the rate of 2 cwt. per acre. There are no large areas of green feed planted for dairy or ordinary stock requirements in the district, and for this reason the farmer is scarcely justified in purchasing a somewhat costly machine to perform, at most, but a single day's work, in the year. The high price of seed, however, is another factor to be considered, for with the drill half the seed can be saved, and there seems to be no reason why such a machine could not be obtained and used on some co-operative principle. The use of a seed drill would, in addition, afford a better and more uniform germination and growth; besides which fertilisers, if used, could be more conveniently distributed through the soil.

Owing to the periodical rainstorms, it was impossible to cut and weigh portions of the various plots at their best, and this will explain to some degree the differences in the yields of the same varieties in different plots. For example, at Condong, Florence was weighed at its best, while Thew, which is a later variety, was cut at the same time; and Huguenot later still, had not nearly reached its maximum growth and weight, though cut at a later date. The variation in the suitable sowing periods of the different districts, together with the variation in the maturing of the several varieties, renders the cutting and weighing of all the plots at their best a physical impossibility under normal conditions of travelling, but when the weather is continuously wet the difficulty is still further increased. For this latter reason the plots at Stuart's Point were completely spoilt. Three weeks of constant rain just as the plots were reaching their best rendered them unfit for green feed, hay, or anything else.

The Varieties Tried.

In analysing the results of the series, it will be seen that Algerian oats gave the highest returns. The season favoured this crop, which was the latest of all in maturing. The latter end of September and October, which are usually more or less dry and hot, were this season well favoured with rain. Rust was, however, very prevalent. The oats on all the plots started well, and the tall sappy growth resulted in much of it lodging.

Of the wheats, Huguenot again stands out in point of yield. Its strong, robust growth enabled it to stand up better than its neighbours, and the leaf and stem were very clean and free from rust.

Florence, one of the new varieties under trial, yielded well and proved itself at least a week earlier than Thew. At a couple of the plots Florence was past its heaviest stage when cut, and the somewhat lighter yields obtained are thus accounted for. It is a very nice wheat and very promising, but further trials are necessary before a definite opinion can be formed of it.

Winter Green Fodder Experiments—North Coast District, 1914.

Variety Trials.

	Joseph Johnson, Condong.	R. E. Burton Bradley, Irvington.	J. Burling, Upper Orara.	H. B. Faviell, Bonville.	P. Secombe, Wauchope.	R. Richardson, Tinonee.	W. P. Reichert, Gloucester.	Averages.
Rainfall in inches ...	17·25	9·91	32 24	39 87	15 45	....	15·83	....
	t. c. q. lb.	t. c. q. lb.	t. c. q. lb.	t c. q. lb.	t. c. q. lb.	t. c. q. lb.	t. c. q. lb.	t. c. q. lb.
Huguenot	9 10 0 0	11 3 1 12	4 15 2 24	7 0 0 0	8 4 1 16	12 3 2 8	14 6 1 20	9 11 3 18
Florence	11 6 1 20	10 12 3 12	4 5 0 0	4 9 1 4	5 10 2 24	7 10 0 0	11 13 2 8	7 18 1 2
King's Early...	9 18 2 8	8 15 0 0	3 14 1 4	5 14 1 4	7 5 2 24	7 6 1 20	12 5 2 24	7 17 0 16
Thew	7 13 2 8	8 10 0 0	4 13 2 8	6 9 1 4	8 12 0 16	7 1 1 20	12 15 0 0	7 19 1 4
Algerian Oats	8 11 1 20	7 12 3 12	6 8 2 8	....	12 8 2 8	13 2 3 12	13 0 0 0	10 4 0 15

Manurial Trials.

Thew (manured)	10 7 0 16	11 7 0 16	5 0 0 0	5 12 3 12	8 12 0 16	....	13 2 3 12	9 0 1 12
Thew (unmanured)	7 13 2 8	8 10 0 0	4 13 2 8	6 9 1 4	8 12 0 16	....	12 15 0 0	8 2 1 2
Huguenot (manured) ...	....	....	....	....	....	9 18 2 8	....	....
Huguenot (unmanured) ..	....	....	....	....	....	12 3 2 8	....	....
Algerian Oats (manured) ...	10 12 0 16	8 10 0 0	9 4 1 4	....	13 7 3 12	14 0 0 0	14 17 3 12	11 15 1 12
Algerian Oats (unmanured)..	8 11 1 20	7 12 3 12	6 8 2 8	....	12 8 2 8	13 2 3 12	13 0 0 0	10 4 0 5

The plots of Mr. C. J. Rogers, Stuart's River, were spoilt by heavy continuous rain when reaching maturity.

King's Early is about the same as Thew in its season of growth. Though yielding well, it is a variety that cannot be recommended for this district, for it is bearded, harsh and wiry in the stem, and takes rust very badly. Throughout the whole of the coast it suffered most from the effects of rust, and stock showed a decided disinclination to take to it.

Thew still maintains its reputation as an early and clean variety, either for green fodder or hay. For the latter purpose it should not be planted early; otherwise it requires to be harvested in early September, when cool wearher, heavy dews, and spring showers do not favour rapid drying.

By planting either Thew or Florence, and at the same time Huguenot, it will be found that a good supply of green feed can be well maintained, Huguenot being some weeks later in growth will have reached its best just about the time that the Thew and Florence are finished.

Manurial Trials.

In the manurial trials, superphosphate was used on plots of Thew wheat and Algerian oats at the rate of 1 cwt. per acre. Notwithstanding the heavy rainfall, it is significant that on nearly all the plots increased yields were obtained from the use of the manure. The manure was broadcasted by hand at the same time as the seed was sown, and then well harrowed in.

SOUTH COAST WINTER FODDER EXPERIMENTS, 1914.

R. N. MAKIN, Inspector of Agriculture.

THE experiments this season were severely handicapped at sowing time owing to exceptionally heavy rain occurring during the month of March. The first plot, sown 18th March, 1914, on Mr. C. T. Hindmarsh's farm at Gerringong was completely washed away, and that on Mr. W. H. Cook's farm, Unanderra, suffered severely from the continuous rain. Portion of the latter plot was re-sown by broadcasting, but the ground being so sodden the grain failed to make satisfactory growth. During the month of March it was a difficult matter to work the ground in any manner. At Albion Park a total fall of 26·08 inches was registered, and practically the same conditions prevailed throughout the whole length of the South Coast; consequently most of the sowing took place during April, the ground having been ploughed again after being battered down by the heavy rain.

Germination.

Naturally the soil temperature was much reduced by the constant heavy rain, and to this must be attributed the irregular germination which was noted in many districts. Many farmers blamed the starlings, but when

drier conditions arrived in June, the weak germination of seed sown in April was noted. It cannot be said, however, that any one variety of wheat germinated better than another under these conditions. The wet season continued throughout the growing period, another deluge occurring in July when 870 points were registered at Kangaroo Valley, where the total fall during the four months in which the crops occupied the ground was 26·61 inches. Fortunately, in this case, the soil was fairly porous and the water got away; in most other cases the ground remained wet and cold throughout and growth was not so satisfactory.

Draining.

There is certainly much to be learnt in a season such as the past, the most striking point being the effect of heavy rain on soils not well drained. The question of draining, especially as regards most of the old cultivation paddocks on the South Coast, should be studied. Last winter many paddocks lost most of the surface soil through neglect in this direction; and wash-aways such as occurred in some parts mean serious loss as the land is considerably impoverished.

There are different ways of getting rid of surplus moisture and there is no excuse for bad drainage, especially on rising ground. Underground drains are most effective and should be constructed in all cultivation paddocks where the natural drainage is faulty. At any rate after sowing any paddock for winter crops, furrows should be run to carry off storm waters; and some consideration should be given in ploughing to the "lie" of the ground.

Wheat likes well-drained sloping ground. Oats do not root so deeply as wheat, which probably accounts for their doing better on the lower levels.

The Wheat Drill.

A new departure in sowing operations was made during the season by the Department in the introduction of the wheat drill. All plots, except those at Kangaroo Valley, were drilled in, the drill being taken from plot to plot in the Illawarra district. This thorough method of sowing seed and manure did not take long to convince some of those who came in contact with it, and several drills were purchased at once; and it is hoped more of them will be seen on the Coast this season. Attention might be drawn to the table showing the returns from two seeding trials on Illawarra, one at Yallah on hilly ground, the other at Unanderra on flat ground. It will be noted from these two experiments that with the drill from a bushel to a bushel and a half is ample seeding. South Coast farmers seldom sow less than 2 bushels broadcast; they know they will not get a good germination if they don't, so they throw away about a bushel of expensive seed to be eaten by birds or perish through weak germination owing to bad covering. Surely this saving by means of drilling is a sufficient reason for the purchase of a drill. There is another point of great importance in connection with the drill. Where artificial manure is used it pays to employ the drill, as will be seen from a glance at the results of the manurial experiments. The effect of the manure

is likely to be felt more when drilled, as it is deposited in such a position that the young plant will get the benefit of it, whereas in broadcasting, even when the greatest care is exercised, an uneven distribution is made, and everyone who has handled bone-dust or superphosphate knows the difficulty of sowing, even in a light breeze. With the drill the sowing may be carried out on the windiest of days. It is to be hoped that in the coming season farmers will make themselves acquainted with the Government drill when it is being used in their districts. Last season notice of the sowing operations was given in the different localities, but the response was generally poor, the best being in the Dapto district, where the farmers take interest in these matters—indeed, it was here that several farmers combined and bought a machine. Notices will again be posted during the coming season, and farmers will be welcome at the plots in their own districts.

Varieties.

Five variety trials were sown for green fodder, one of which (Gerringong) was washed away. In all, ten varieties were sown, and there was a marked difference in them in regard to period of growth. Omitting the Mittagong plot, which is on the highlands, and taking the coastal plots only, the first plots were fit for cutting, and were harvested at Albion Park on 15th July, about three-and-a-half months after sowing, the varieties being Florence, King's Early, and Bunyip. A number of local farmers attended on this date, and were very favourably impressed with the whole of the plots, and particularly with the varieties harvested. The last wheat to be harvested, on plots ere it was tried, was Marquis. This wheat is well known in Canada as a grain producer, and a few years ago was introduced into the cooler portions of this State. Seed was secured for the fodder experiments on the South Coast, but, whatever may be said for it elsewhere, it is certainly unsuitable for early green feed, on account of its late maturity. Some good returns were again forthcoming from Thew wheat, although the season did not suit it; it appeared to be later in running up than on former occasions. Firbank did well, so also did Steinwedel, but it developed much rust, and on that account cannot be recommended. Huguenot maintained its reputation, but it is rather late, and at Albion Park climbing cut-worms spoilt the whole plot. John Brown, as usual, was amongst the last to run into ear, and in some cases showed rust. Warren made fair growth, but is not as suitable as other earlier varieties which make greater bulk.

Summing up the varieties most suitable for green feed in order of earliness, the positions from these experiments would be Florence, King's Early, Firbank, Bunyip, and Thew. On the average, Florence was a month ahead of Thew, and King's Early somewhere about the same, perhaps a week later than Florence. King's Early attracted a good deal of attention from the dairy farmers, on account of its solid stem; it carries a beard, but this is no fault, as when fed green this can be assimilated by stock. In some cases rust was in evidence, so that late sowings of this variety are not recommended.

Manurial Trials.

Owing to the rush of work brought about by the heavy rain holding up sowing operations in March, only one manurial experiment, including mixtures, was sown, and that was at Bega. Thew wheat was used for the purpose, the plots being drilled in. The soil was of granite formation, and the situation was on a hillside. Two plots were left unmanured, one amongst the mixtures, and the other where the different quantities of superphosphate were tried. Each block was one-fourth of an acre in area, with a space of about 1 foot between the blocks. From the table it will be seen that of the mixtures W 2 gave a return of 4 tons above the unmanured at a cost of 15s. This mixture is composed of—

6 parts superphosphate.
3 „ sulphate of ammonia.
1½ „ sulphate of potash.

It was applied at rate of 1½ cwt. per acre.

The mixture P5 is composed of—

16 parts superphosphate.
4 „ sulphate of potash.

It was applied at rate of 1¼ cwt. per acre, and is worth about £7 10s. per ton.

The third mixture, M5, is composed of—

13⅓ parts superphosphate.
6⅔ „ sulphate of ammonia.

It was applied at rate of 1½ cwt. per acre, and is worth about £9 15s. per ton.

The results from these mixtures are satisfactory as compared with no manure; even contrasted with the second unmanured plot, where the soil was slightly better, an increase is to be seen. There is no doubt that superphosphate, when used alone, is a great help to the plant in establishing itself, and apparently not a great amount is required. As will be seen from this experiment 60 lb. per acre gave an increase of over 1 ton per acre of green feed over the unmanured plot adjoining it, and this at an expense, roughly, of 2s. 6d. The action superphosphate has on the plant is to build up the root system, and when this is well developed the plant can withstand trying conditions, and consequently make better growth than otherwise.

In the variety trials superphosphate was used throughout, and a plot of Thew was sown without manure for comparison. The most striking difference was noted at Albion Park where a return of 3 tons was obtained in favour of the manured portion. At Mittagong this was reversed, there being a return of over 1 ton in favour of the unmanured. This can be accounted for in that the manured plot was sown on ground with a "finish" running through it. At the time of drilling this was not noticed; had it been seen the "finish" would have been used as the division between the plots. The effective use of superphosphate has now been abundantly proved, for even in drier seasons satisfactory increases over unmanured sections have been obtained.

Top-dressing Experiments with Nitrate of Soda.

Another section of the winter fodder experiments was top-dressed with nitrate of soda with a view to increasing the bulk. Nitrate of soda is a highly soluble salt, and ranks amongst the nitrogenous manures. Sections were set out in the wheat trials, 1 chain uq are, and when the wheat was about 6 inches high, top-dressed with the nitrate at the rate of ½ cwt. per acre. Later, when the crop was running up into ear, half of this area was again treated at the same rate, and an adjoining patch was measured off and left untreated. The top-dressing was carried out by crushing the manure down very fine and sowing broadcast by hand. In every case, soon after the application, a dark healthy green colour was observed in the sections. The returns, however, were not as good as perhaps they might have been under different conditions. The heavy rainfall was too great for such a highly soluble manure, and probably the crop did not get the full benefit.

Wheat for Hay.

At Taralga a wheat plot comprising a variety and manurial trial was sown on Mr. J. Howard's farm at Richlands. The paddock was an old cultivation of basaltic formation, with ironstone patches in it, and the sowing was made on 27th May, which is a little late for the best results. During the growing period 10 inches of rain fell, and the crops were harvested on 14th December. Considering the paddock was in cultivation as far back as 1854, the returns must be considered satisfactory. A late frost spoilt the young grain in patches of the Cleveland plots. From the tables it will be seen that the best returns were from Yandilla King, which came on quickly, but together with Bobs and Marshall's No. 3 it showed some rust; earlier sowing would probably get over this trouble. Cleveland is undoubtedly a suitable hay wheat for this district. These plots were all manured with superphosphate at the rate of 60 lb. per acre.

In the manurial trial two mixtures, basic slag, and superphosphate were tried, and, as will be seen, the basic slag gave the best returns. The sheaves from this plot weighed well in comparison with others. The difference, however, between the plots manured is not very great. One point is apparent, and that is that it will pay to manure. Further manurial trials in this district should bring forth some useful information.

Trials with Oats.

Two trials with oats were conducted, one at Yallah, embracing five varieties, and another at Bega, two varieties. At Yallah, three varieties, Defiance, Abundance, and Algerian Tartar, rusted so badly that no account could be taken of them, whilst Algerian and Ruakura varieties did remarkably well; although the Algerian developed a little rust it managed to grow well afterwards. As regards Ruakura, judging by this trial, it is undoubtedly the best oat ever tried on the South Coast experiment plots. It was absolutely free from rust, was a month earlier in maturing than Algerian, and produced a large quantity of succulent green feed. It may be found a

bit coarse for hay, but as green feed it should be excellent. It also carries a very good head. It originated in New Zealand, and at present seed is rather scarce. It is hoped that a test of this variety will be carried out on all the South Coast plots this winter.

In the Bega trial, Algerian beat the crossbred. It cannot be said that Algerian Tartar is as good as Algerian for coastal conditions.

The results are contained in the accompanying tables :—

South Coast Winter Fodder Plots, 1914.
Wheat Variety Trials.

Variety.	J. Chittick, Kangaroo Valley.				W. H. Cook, Unanderra.				Farm Home, Mittagong.				T. A Bateman, Albion Park.			
	t.	c.	q.	lb.	t.	c.	q.	lb.	t.	c.	q.	lb.	t.	c.	q.	lb.
Florence	10	12	3	12	3	9	1	4	9	0	0	0	9	0	0	0
King's Early	12	1	1	20	4	0	2	24	7	3	2	8	6	17	0	16
Firbank	11	18	2	8	2	17	3	12	10	5	0	0	7	19	1	4
Bunyip	9	5	2	24	3	7	3	12	10	17	3	12	6	18	2	8
Huguenot	8	2	3	12	5	0	0	0	9	7	3	12	destroyed.			
Warren	10	0	0	0	3	8	2	8	....				....			
John Brown	8	17	0	16	4	4	1	4	11	13	2	8	6	2	3	12
Steinwedel	10	0	0	0	5	0	0	0	11	10	0	0	9	17	3	12
Thew	11	15	2	24	5	17	2	20	11	5	0	0	10	18	0	24
Thew (no manure) ...	11	4	1	4	4	4	1	5	12	5	3	16	7	18	0	24
Marquis	8	17	2	20	5	7	3	12	11	0	0	0	....			

Seeding trials with wheat drills :—

Amount of seed per acre.	Brown Bros., Yallah.				L. Carr, Unanderra.			
lb.	t.	c.	q.	lb.	t.	c.	q.	lb.
120	7	8	2	8	3	18	1	16
99	7	4	1	4	3	10	0	0
88	8	2	0	16	3	18	1	16
78	8	17	0	16	3	12	0	16
58	7	10	0	0	4	15	0	0
30	5	11	1	20	2	. 6	1	20

South Coast Winter Fodder Plots, 1914.
Manurial trials. Wheat for green feed.

Manure.	C. Sproates, Bega.				Manure.	J. Howard, Taralga.			
	t.	c.	q.	lb.		t.	c.	q.	lb.
P. 5	6	15	0	0	Superphosphate, 60 lb. per ac.	2	11	0	3
W. 2	8	15	0	0	P. 5	2	10	3	6
No manure	4	15	2	24	Basic Slag	2	14	3	23
M. 5	6	5	2	24	No manure	2	0	1	12
Superphosphate, 175 lb. per ac.	6	0	2	24	W. 3	2	13	2	3
,, 150 ,,	7	0	0	0					
,, 100 ,,	6	7	0	16					
,, 60 ,,	6	1	1	20					
No manure	7	2	3	12					

SOUTH COAST WINTER FODDER PLOTS, 1914.

Trial of top-dressing with nitrate of soda. Wheat for green feed.

Treatment.	W. H. Cook, Unanderra.	Brown Bros., Yallah.	J Chittick, Kangaroo Valley.
	t. c. q. lb.	t. c. q. lb.	t. c. q. lb.
Top-dressed once, at the rate of ½ cwt. per acre.	5 17 3 12	7 0 2 24	12 2 3 12
Top-dressed twice, ½ cwt. per acre each time.	5 10 0 0	7 13 2 8	12 10 0 0
Untreated	4 0 2 24	7 10 0 0	11 15 2 24

SOUTH COAST WINTER FODDER PLOTS, 1914.

Oats for green feed.

Variety.	Brown Bros., Yallah.	Variety.	C. Sproates, Bega.
	t. c. q. lb.		t. c. q. lb.
Ruakura	14 2 3 12	Algerian Tartar	7 17 0 16
Algerian	8 18 2 8	Algerian	8 6 1 20

SOUTH COAST WINTER FODDER PLOTS, 1914.

Wheat for hay.

Variety.	J. Howard, Taralga.
	t. c. q. lb.
Yandilla King	2 14 2 16
Zealand	2 0 0 25
Marshall No. 3	2 9 2 1
Bobs	2 1 2 12
Cleveland	2 11 0 3

The Use of Copper Carbonate as a Fungicide.

G. P. DARNELL-SMITH, B.Sc., F.I.C., F.C.S., Biologist.

THE ideal fungicide for "pickling" wheat for the prevention of infection by bunt spores is one which shall in no way interfere with the normal germination of the wheat grain, and which shall, at the same time, kill or prevent infection by the spores of bunt.

The first consideration is too often overlooked; a fungicide which will kill bunt spores, but which, at the same time, kills or prevents the normal germination of the wheat grains, is, for all practical purposes, useless. As a result of many experiments, the Department recommends the dipping of seed-wheat in a 1½ per cent. solution of bluestone, followed by dipping in lime-water.

The second dipping in lime-water is regarded as of great importance in overcoming the deleterious effects of bluestone upon healthy germination.

To treat the wheat first with bluestone and then with lime-water is, in effect, to treat it with Bordeaux mixture, which is prepared by adding milk of lime to a solution of bluestone. There is then formed a bluish-white precipitate. The compounds of which this precipitate is formed vary greatly with the proportions of the ingredients used and the conditions under which the mixture is made. The question arose as to whether it would not be possible to treat wheat with this Bordeaux powder, or one of very similar composition, in the dry state, and thus do away with the "messy" process of pickling. Moreover, it has been suggested that the failure of wheat to germinate properly after "pickling" may be due to the fact that it has been wetted and then dried. If, as is possible, the first wetting of the seed after it has been in store starts a train of reactions leading to germination, to moisten seed (as in pickling) and then to dry it, is not a reasonable process, for the seed would undergo a partial (if only very slight) germination, and would then be arrested in its normal development. Experiments carried out in the laboratory with dry seeds, and with seeds wetted and then dried, did not give markedly different results. Nevertheless, conditions for germination in the laboratory are so favourable that the results are not quite comparable with what might happen in the field.

To get over the possible evil effects of wetting the seed in pickling, the use of dry copper-carbonate was suggested. It has been tried experimentally for two years at the Wagga and Cowra Experiment Farms with extremely good results. The germinating power of the seed was excellent, as was its freedom from bunt (the seed was purposely infected with bunt spores before sowing).

There is danger in drawing definite conclusions as to the results of experiments in agriculture extending over two years only; neither the seasons nor the soil conditions may have been favourable for the development of bunt. Nevertheless, the use of dry copper carbonate as a fungicide appears to present considerable possibilities.

The method of treating the seed with copper carbonate was to shake it up with the powder in a small bag in the proportion of 4 oz. of the powder to 1 bushel of wheat. No doubt less than this amount could be used and a method invented of more easily treating the seed. The powder readily adheres to the "brush" of the grain, where the bunt spores chiefly reside, and to the characteristic groove that runs along a wheat seed.

Insectivorous Birds of New South Wales.

[Continued from Vol. XXV, page 1052.]

WALTER W. FROGGATT, F.L.S., Government Entomologist.

No. 49. The Straw-necked Ibis (*Carphibis* (*Geronticus*) *spinicollis*).

In the Ibis family we have a very interesting group of large insectivorous birds, the members of which are found in most parts of the world. In Australia the family is represented by three species, which are to be found in all the different States. The "Glossy Ibis" (*Plegadis falcinellus*) is the smallest of the three, and, unlike the others, has the whole of the head and neck feathered. The whole of the plumage is of a uniform chestnut-brown tint with glossy metallic reflections. Though it is our rarest species the "Glossy Ibis" has a very wide distribution, being found in England, Southern Europe, Northern Africa, across Asia to Australia, and it is also found in marsh lands of the south-east of the United States in Florida.

The second is the "White Ibis" (*Ibis molucca*) which, though confined to Australia, New Guinea, and some of the southern islands of the Malay Archipelago, is closely related to the "White Ibis" or "Sacred Ibis" of Africa, which was worshipped in ancient Egypt, where it used to appear every year from the interior with the inundation of the Nile delta lands. Many mummies of these birds have been found in the excavations among the tombs, and in the time of the Pharaohs it was a capital offence to kill an ibis. It is said that when Cambyses, King of Persia, laid siege to the town of Damietta, he placed a number of sacred ibis in front of his soldiers who led the attack, and the Egyptian defenders capitulated rather than allow the destruction of these birds; to such an extent was this veneration carried out in ancient Egypt.

The common "White Ibis" has the bare head, beak and legs black, and a few black plumes in the wings. Often noticed in pairs about the swamps, they also congregate in flocks and do a great deal of useful work in destroying all kinds of insect pests. Though not so numerous in New South Wales as the "Straw-necked Ibis" they rank well up in the list of useful insectivorous birds.

The third species, illustrated in this series, is typical of the family and well known all over the State as the "Black and White Ibis," on account of its general colouration, or the "Straw-necked Ibis," because of its remarkable neck ornamentation, formed of aborted feathers. The shafts of the neck feathers are produced into slender, yellow, cylindrical-pointed tubes, not unlike the quills of a porcupine, and in the old birds hang down in quite a large bunch. In Victoria the sportsmen used to call them "Pick-axe Geese," on account of

Slightly less than quarter natural size.

INSECTIVOROUS BIRDS OF NEW SOUTH WALES.

"THE STRAW-NECKED IBIS."

Carphibis (Geronticus) spinicollis.

their curiously-shaped beak, and also from their somewhat similar harsh croak or honk, like the call of the wild geese when flying high up in the sky strung out in a wide V-shaped formation when crossing the plains.

Latham, who was the first naturalist to describe this bird, called it the "New Holland Ibis;" later on Jamieson gave it the name of *Ibis spinicollis*, but Grey placed it in the genus *Geronticus*; this Gould adopted in his large folio work, but he changed it to the genus *Carphibis* in his "Handbook of the Birds of Australia." Though some modern writers retained the generic name *Geronticus* later naturalists dealing with our birds followed Gould, and it is now fixed in the genus *Carphibis*.

The "Straw-necked Ibis" is one of the best known and most popular of Australian birds, and if the farmers and squatters do not look upon it as sacred, in a similar way to the ancient Egyptians, they value it as one of their most important insectivorous birds. No one would think of shooting an ibis in a country district. It is not, generally speaking, a coastal visitant, but is found all over the inland country, a frequenter of the shores of inland lakes, marshes, and swampy country in the winter months, where it finds large food supplies in the fresh water crustaceans, insects, and frogs.

In the early summer months these birds congregate in enormous flocks to nest in the reed-beds and swamps of the Lachlan River and other parts of the Riverina country. Le Souef estimated that in a swamp of about 400 acres in extent, which his party visited in the nesting season in southern Riverina, there were fully 100,000 ibis in possession.

There is hardly any attempt at nest-making; the nest is simply a handful of rushes, flags, or grass, scratched together on the top of the trampled-down vegetation, in the centre of which are placed usually three, but sometimes four, pale greenish-white eggs. In these swamps the nests are almost touching, and the whole surface of the reed-beds is one sheet of eggs like a seagull's rookery. As the young birds grow up, but are unable to fly, they are shepherded together by some of the old birds on the trampled-down lignum and reeds so that they cannot get into the surrounding water, where, if unwatched, many of them would get drowned.

With the advent of the cutworm plagues in the grass paddocks, and the hatching-out of the swarms of baby grasshoppers later on in the season, the ibis flocks, freed from their domestic duties, scatter all over the plains, forest, and scrub. Broken up into small flocks of from fifty to several hundred, they may be seen strutting or walking about in a very leisurely manner feeding upon these pests, or, later in the day, when fully fed, resting upon the dead trees or sleeping on the fallen logs, where they are so little disturbed by man that they take very little notice of anyone passing along the road.

From its large size, fondness for some of our very worst insect pests (grasshoppers and cutworms), and its numbers, the ibis is one of the most valuable insectivorous birds in Australia, and not only should the birds be protected, but their nesting grounds should be proclaimed sanctuaries and no shooting allowed in these areas.

No. 50. The Australian Bustard or Plain Turkey

(*Eupodotis australis*).

The writer considers an old cock bustard in full spring plumage, strutting about over the open plains looking after three or four of the smaller hens, as the most handsome and stately of all our birds. The harmonious blend of the pepper and salt plumage, upright carriage, sweeping neck plumes, and his bright yellow eye, keeping keen watch all round, over the grass and salt-bush, is a sight to be remembered.

The bustard is found all over Australia, but migrates from one part of the country to the other, following its food supplies, and, in the old days, on the plains of north-west Victoria as soon as the grasshoppers made their appearance we were sure to have the wild turkeys in the paddocks within a few weeks.

It is the sole representative of a group of birds (*Otidæ*) that is widely scattered over the world. A few hundred years ago one species was common in the south of England, and used to be hunted with greyhounds. Others are found on the plains of Africa and Asia.

In the breeding season the female makes no nest, but deposits her egg (some writers say there are sometimes two) in a depression in the ground or crab-holey country or near lignum bushes. The baby turkey, as soon as he hatches out of the egg, is as cunning as most ground birds, and can look after himself. Never moving when discovered, he will allow himself to be picked up and handled, but will run off when replaced on the ground.

In regard to the food of the bustard, the writer finds some very curious statements published. Mr. Aflalo, in his "Natural History of Australia," speaking of the bustard says, "Lives entirely on the open plains, feeding upon lizards and roots. As a game bird, the bustard ought to be protected, but a great deal of nonsense has been written about the great importance of the bustard or wild turkey from an insectivorous standpoint. In northern Victoria, though the wild turkeys used to follow the grasshoppers, they were always rare birds, and a flock of a dozen or twenty was a large one; usually they were found in a family party of four or five, and on a 600-acre paddock full of grasshoppers would not make as much impression on the pest as the crows or magpies." In Lucas and Le Souef's "Birds of Australia," the authors say, "At times when crammed with grasshoppers, which they are doing their best to destroy, they fall victims to the stick of the ungrateful but hungry settler." If the authors mean that the wild turkeys, gorged to repletion, can be approached and killed with a stick by a hungry selector, they must have deteriorated or be very different birds to those we used to hunt on the plains of northern Victoria.

The writer has examined the crops of many bustards in old days, and in the spring the main part of their food consisted of dandelion heads and other vegetable matter, together with a few centipedes, ground weevil beetles, and the few other insects found on the plains. In the summer the crops contained chiefly grasshoppers, but their food was very varied. In Victoria, in particular, the great insectivorous value of the bustard has been very much

Approximately one-sixth natural size.

INSECTIVOROUS BIRDS OF NEW SOUTH WALES.

"THE AUSTRALIAN BUSTARD OR PLAIN TURKEY."

Eupodotis australis.

overrated—for example, see Mr. Hall's "Useful Birds of Southern Australia" when dealing with this bird.

The bustard, like all other large game birds which nest upon the ground, is bound to disappear with the advance of civilisation, wire fences, cultivation paddocks, and forest destruction, to say nothing of the introduction of the fox and other ground enemies. It is our finest game bird, and should be protected as a game bird, and it would probably increase in time in uncultivated areas, when it would be a valuable asset, for the writer has weighed many bustards ranging from 12 lb. to 16 lb. in weight, and it was not uncommon to get one over 20 lb. in weight.

From a sportsman's point of view, the bustard was always a sport that took good hunting, and, if his luck was out, one might spend all day and never get a bird—it was turkey-cunning against the hunter. Many a day the writer has spent driving turkeys, which was as great an art as the shooting. The success of the day's bag depended not only on the aim of the sportsman, but the skill and judgment of the driver, who, driving gradually, not towards the feeding birds, but in ever lessening circles gradually brought the vehicle with the shooter sitting behind within range of the watching bird. The moment the trap stopped, the turkeys were up, and if the old horse had been badly trained, he also was restless, so that it took a good shot to bag his bird at anything near 100 yards. On very hot days, however, the wild turkeys were not so active, and had a very curious habit (particularly if feeding in crab-holey or rough ground) of "squatting," evidently under the impression they were concealed from the approaching enemy. They would squat close to the ground, draw the head and neck down on the body, and if the watcher happened to take his eye off just before this vanishing trick was effected, it was often very difficult to locate the exact spot where the game was hidden. Sometimes this trick would be done on an absolutely bare patch of soil, and the bird would allow one to get within easy range under the mistaken idea that he was quite safe.

In north-west Australia, in from King's Sound, the writer has seen the bustards in comparatively thick scrubby land, but in New South Wales and Victoria they are seldom seen off the plains.

Official Milk and Butter Records.

M. A. O'CALLAGHAN.

Below are given a number of records of pure bred cattle that have completed their tests recently. With the exception of four Guernseys, they are all Jerseys.

There are no sensational records to report, the best being that of Miss Eadith Walker's Jersey cow, Olive, by the old champion bull, Maitland Pride, from Olga II, by Magnet's Boy 18th; and having as great-grand-sire Effingham Duke (imp.). Next to her comes Mr. Manning's well-known show-ring cow, Annette (imp.). The record of this cow, of 414 lb. of butter for the nine months, actually shows up better for a twelve months' period, she having given 7,618 lb. of milk, which produced 525 lb. of butter during a twelve months' test, her owner having decided to run her for the full year.

A couple of years ago I purchased a young bull from this cow for the Queensland Government. This was before any record of the cow was known, so that the Queensland Government should now feel pleased with their bargain.

Messrs. Kinross Bros.' Jersey Herd, at Jamberoo.

Period of Test.	Name of Cow and Herd Book No.	Age at beginning of Test.	Date of last Calving.	Total Milk.	Total Butter.	Average of Butter Fat Tests.	Yield on last day of Test.	
							Milk.	Butter.
days		y. m.		lb.	lb.		lb.	lb.
212	Pearl of Minnamurra ...	4 0	7 August, 1913 ...	3,899	214	4·9	8·50	·61
243	Pearl III	7 0	10 June, 1913 ...	4,451	223	4·4	3·50	·17

Mr. O. H. Gollan's Jersey Herd, at Woodburn.

Period of Test.	Name of Cow and Herd Book No.	Age at beginning of Test.	Date of last Calving.	Total Milk.	Total Butter.	Average of Butter Fat Tests.	Yield on last day of Test.	
							Milk.	Butter.
days		y. m.		lb.	lb.		lb.	lb.
243	Lady Larkspur, 1120 ...	7 0	28 Sept., 1913 ...	3,337	221	6·0	9·00	·72
273	Picture of Woodburn, 2465	8 0	7 Nov., 1913 ...	4,579	221	4·3	3·25	·19
273	Winsome's Belle... ...	2 9	5 Nov., 1913 ...	3,237	214	5·9	7·50	·53
273	Lovenot	9 0	23 Oct., 1913 ..	4,411	262	5·2	5·25	·31
273	Maitland's Gentle Lass II	2 0	18 Nov., 1913 ...	3,508	213	5·4	4·00	·26
273	Maybelle of Liry Clea 572	7 0	27 Nov., 1913 ...	3,665	224	5·4	6·00	·38
273	Rosaline, 2565	5 0	26 Nov., 1913 ...	4,816	311	5·6	10·50	·71
273	Silver Lady	2 6	8 Feb., 1914 ...	4,453	261	5·1	11·75	·75

Mr. A. L. Manning's Jersey Herd, at Bega.

Period of Test.	Name of Cow and Herd Book No.	Age at beginning of Test	Date of last Calving.	Total Milk.	Total Butter.	Average of Butter Fat Tests.	Yield on last day of Test. Milk.	Butter.
days		y. m.		lb.	lb.		lb.	lb.
243	Lady Magoet, 496 ...	8 3	8 June, 1913...	3,585	226	5·7	7·00	·54
242	Tamborine, 1417 ...	5 8	4 August, 1913...	4,529	251	5·1	2·50	·18
212	Melody, 580	7 3	5 August, 1913 ..	4,760	270	5·1	10·00	·65
273	Ballerina II	......	2 August, 1913...	4,021	277	6·1	9·00	·70
242	Magnet's Lass II, 1178...	6 0	30 August, 1913...	4,815	303	5·5	10·00	·75
273	Rosebud Starbright, 2573	3 0	30 August, 1913...	3,937	207	4·6	5·50	·31
273	Jessie's Progress III, 468	8 4	6 Sept., 1913 ..	4,633	278	5·4	11·00	·73
273	Mother of Pearl, 2385 ...	1 10	19 Sept., 1913...	4,056	260	5·7	11·50	·83
273	Majesty's Dido	.....	20 Sept., 1913 ..	4,158	272	5·9	10·50	·81
273	Annette (imp.)	6 9	23 October, 1913...	6,100	414	6·0	18·00	1·32
273	Naiad, 2405	2 10	18 October, 1913 .	3,762	233	5·6	12·00	·88
273	Miss Mischief, 1233 ...	4 2	22 October, 1913...	4,575	277	5·5	11·00	·67
273	Columbus Starbright ...	2 8	22 October, 1913...	3,855	229	5·3	13·00	·90
273	Serenade, 1370	5 0	5 Nov., 1913...	4,101	249	5·4	12·50	·83
273	Dancing Girl II, 537 ...	10 0	12 October, 1913...	4,176	253	5·4	14·50	·87
273	Soprano, 1395	4 7	1 Nov., 1913...	5,415	367	6·1	18·00	1·27
273	Nada, 1257	4 3	3 Jan., 1914...	3,646	234	5·8	11·50	·83
273	Molly Bawn VIII, 1236	6 10	14 Jan., 1914...	5,920	367	5·6	18·00	1·09

Scottish Australian Investment Co.

Period of Test.	Name of Cow and Herd Book No.	Age at beginning of Test.	Date of last Calving.	Total Milk.	Total Butter.	Average of Butter Fat Tests.	Yield on last day of Test. Milk.	Butter.
	Amended Test—	y. m.		lb.	lb.		lb.	lb.
	Bessie II, 817	9 0	5 July, 1913 ...	9,860	487	4·4	16·50	9·6
	(See July, 1914 issue).							

Mr. J. Rixon's Jersey Herd, at Nashua.

Period of Test.	Name of Cow and Herd Book No.	Age at beginning of Test.	Date of last Calving.	Total Milk.	Total Butter.	Average of Butter Fat Tests	Yield on last day of Test. Milk.	Butter.
days		y. m.		lb.	lb.		lb.	lb.
273	Pearl, 2450	6 0	16 Aug., 1913 ...	4,381	338	6·8	11·00	·89
243	Sapphire of Nashua, 2600	7 0	19 Sept., 1913 ...	3,910	213	4·9	9·25	·61

Messrs. Anderson Bros.' Jersey Herd, at Gladstone.

Period of Test.	Name of Cow and Herd Book No.	Age at beginning of Test.	Date of last Calving.	Total Milk.	Total Butter.	Average of Butter Fat Tests.	Yield on last day of Test. Milk.	Butter.
days		y. m.		lb.	lb.		lb.	lb.
242	Beauty	7 0	— October, 1912...	4,838	237	4·7	7·50	·45
186	Opal	5 6	22 January, 1913...	3,876	201	4·9	13·00	·59

Mr. E. P. Perry's Guernsey Herd, at Parkville.

Period of Test.	Name of Cow and Herd Book No.	Age at beginning of Test.	Date of last Calving.	Total Milk.	Total Butter.	Average of Butter Fat Tests.	Yield on last day of Test. Milk.	Butter.
days		y. m.		lb.	lb.		lb.	lb.
273	Betsy III of the Vaquiedor (imp.)	2 10	26 Feb., 1914 ...	5,514	228	4·6	17·50	·94
273	La Petite Janne III (imp.)	2 6	21 Feb., 1914 ...	4,622	222	4·2	14·75	·78

Mr. A. E. Brown's Jersey Herd, at Bangalow.

Period of Test.	Name of Cow and Herd Book No.	Age at beginning of Test.	Date of last Calving.	Total Milk.	Total Butter.	Average of Butter Fat Tests.	Yield on last day of Test. Milk.	Butter.
days		y. m.		lb.	lb.		lb.	lb.
224	Sensation II	5 0	17 Dec., 1912 ..	4,414	247	5·1	8·00	·50
242	Lady Trenton	......	25 Oct., 1912 ..	3,915	201	4·6	4·50	·25
254	Baroness II	2 7	18 Dec., 1912 ...	4,533	268	5·1	10·00	·47
273	Baroness I of Ingleside...	5 6	9 Mar., 1913 ...	6,692	385	5·1	16·00	1·06
273	Countess	7 0	22 Mar., 1913 ...	4,340	249	5·0	9·50	·52
273	Lady Pandora II of Ingleside.	4 8	19 April, 1913 ...	4,954	242	4·2	4·50	·20
273	Thelma's Bessie of Ingleside.	5 6	26 April, 1913 ..	4,844	230	4·0	4·00	·16
273	Silver Lass of Ingleside	5 10	14 June, 1913 ...	5,421	263	4·3	19·00	·84
273	Lady Hetty II of Ingleside.	3 2	18 Aug., 1913 ...	4,579	238	4·7	9·00	·64
253	Lady Pandora IV ...	3 0	3 Sept., 1913 ...	4,501	227	4·6	9·00	·60
273	Gentle Lily	ab't 8 ys.	24 Aug., 1913 ...	4,442	262	5·2	9·00	·69
273	Gem II	......	8 Oct., 1913 ...	5,005	241	4·4	9·00	·58
273	Beatrice II of Ingleside	7 2	29 Sept., 1913 ...	5,544	264	4·2	10·00	·64
273	Handsome II of Ingleside	2 10	29 Aug., 1913 ...	4,019	210	4·6	7·00	·56

Miss E. C. Walker's Jersey Herd, at "Yaralla," Concord.

Period of Test.	Name of Cow and Herd Book No.	Age at beginning of Test.	Date of last Calving.	Total Milk.	Total Butter.	Average of Butter Fat Tests.	Yield on last day of Test. Milk.	Butter.
days		y. m.		lb.	lb.		lb.	lb.
257	Lady Sheba, 500... ...	7 0	17 August, 1912...	4,772	286	5·3	10·50	·77
243	Lydia	2 0	9 Dec., 1912...	4,202	250	5·1	9·00	·56
273	Olive, 1269	5 0	21 August, 1913...	7,595	474	5·4	12·50	·80
273	Lux	2 0	2 Sept., 1913...	7,087	373	4·6	20·50	1·28
182	Fuschia III, 424	9 5	30 Sept., 1913...	5,500	259	4·2	16·25	·89

The Effect of Marketing Maize too Early.

G. MARKS, Inspector of Agriculture.

ANTICIPATING the complaints that are heard practically every year about the condition of the maize that is forwarded from the North Coast in the early part of the season, Mr. Marks forwarded a report, of which the following is a summary, drawing attention to the seriousness of the matter and the loss that growers suffer in consequence of haphazard methods and the desire to take advantage of the high prices that generally rule just at that time.

Pulling Immature Cobs.

UNDER the impression that all trouble is at an end so soon as the grain is stacked on the steamer bound for Sydney, many North Coast farmers often pull the maize before it is mature, and husk, thresh, and market it before it is dry. It would almost seem that to such men the condition in which the consignment reaches Sydney is of no consequence whatever.

The effect of such a method, however, is that large quantities of early maize (occasionally whole shiploads) arrive in Sydney in a heated, mouldy and even decomposed condition.

In reality, maize that is apparently ripe and dry on the stalk is not necessarily in a condition to be harvested, threshed, and marketed at once. Even in hot, dry weather it requires to be stored for some time where it will mature in the cob before it is shelled, if all risk of deterioration is to be avoided. When the outside of the grain has become quite dry, a considerable quantity of moisture still remains in the core and at the germ end of the grain where it is attached to the core, and if the grain is to be kept in its best condition it must be thoroughly dried before it is shelled. In cobs that have been husked this drying takes some little time, but it necessarily takes longer where the husks have been left on, and longer still if the husk is a particularly thick one.

Drying in Field and Barn.

Farmers are apt to think that because the weather is uncomfortably hot, drying must be going on apace, but they forget that the humidity may, and often does, delay matters considerably. Even in the field the rate of drying is comparatively slow, especially if the stalks are standing in damp ground, but in the average barn of the North Coast it is surprising how long it takes. Were the cobs stored in barns raised off the ground and constructed with open battened walls, through which air currents could freely exercise their drying influences, the time required for storing might be comparatively short, but the typical barn is not of this type. It usually has closely-fitted slab walls with little, if any, roof ventilation, and when the doors are shut to keep out poultry it would take a gale to cause much of a move-

ment of the air inside. Maize pulled before it is reasonably dry could be stored for months in such places, and yet not be in a condition fit for threshing and bulking.

In the Ship's Hold.

Unfortunately the losses occasioned by the shipment of soft, immature maize are not borne by careless growers only. Consignments of prime, dry grain in the same ship's hold are depreciated by the sweating of the poorer parcels, the colour, the fresh, clean appearance and the "ring" or "rattle," all being affected. Other things may allow of sweating in the ship's hold, of course, such as loading in heavy rain, or stacking on damp river banks or in the open for an undue length of time, but it is very doubtful if they are factors of any great consequence. The immature grain that is not properly dried off must be regarded as the most serious.

It can scarcely be inferred that farmers are ignorant of the conditions under which their produce should be harvested, stored, and marketed; 99 out of every 100 know it well enough.

What they do require to recognise, however, is that the present methods not only reduce the value of the consignment, and of other better consignments going forward at the same time, but they also have a damaging effect upon the market and on the reputation of the individual district, for buyers take care to protect themselves against loss on lines from places that have sent two or three poor parcels within a few weeks, their penalties falling, once more, alike on the careless and the careful.

Suggestions as to Improvement.

These may be summarised thus:—

(1) Maize should not be pulled and carted from the field before it is fully matured and dry; to do otherwise is foolish and dangerous.

(2) Unlike the potato crop, which requires to be disposed of as soon as it is fit to harvest, maize should not be marketed immediately it is carted from the field; it should be allowed to dry thoroughly on the cob.

(3) The whole of the season's crop, or a large portion of it, may be lost by rushing it on to the market as soft maize just for the sake of gaining a little in weight and a few pence per bushel in price.

(4) In view of the moist conditions that prevail on the North Coast, drying could be hastened and made more uniform by erecting suitable sheds in which to store the maize until it is quite hard and dry; the time required for this would depend on various factors, such as variety, season, condition when pulled, position and construction of the barn, quantity in the heap or the barn, amount of husk left on the cob, etc.

At the time of writing this report crops are being harvested that would not be too dry if left in the field for another month. With the humid conditions that are bound to continue till after Easter on the North Coast, I feel certain that before very long sweated and heated shipments will be reaching Sydney agents.

"The Soils of New South Wales."

By H. I. JENSEN, D.Sc., Government Geologist of the Northern Territory, late of Chemist's Branch, N.S.W., Department of Agriculture.

THE relation of the marvellously thin layer of a few inches or a few feet of soil with which successive epochs have covered the surface of the earth, to the rock formations from which it has been built up, has been the subject of study from the very beginning of scientific agriculture. The forces of disintegration and attrition alter the form, but the chemical composition retains its characteristics sufficiently to make the geological formation a subject of much importance to the agriculturist. How largely this is true is proved by the variations in the native flora, which are the result of adaptation to soil and climate by means of natural selection and the survival of the fittest. Indeed, so accurate is the native flora as an index of the quality of the soil, that experienced farmers the world over judge the quality of timbered lands by the forest growth, and do so with an accuracy of which even the soil analyst might be proud.

In the work that bears the title "The Soils of New South Wales," Dr. Jensen contends that the primary basis of soil classification should be a geological one. The bushman's classification (which applies such descriptions as scrub land, forest land, red-soil plains, and so forth), the classification as to mechanical properties (such as light, heavy, sandy, loamy, etc.), the classification according to utility (such as wheat land, maize land, or lucerne land), the chemical and other classifications are useful, but the geological one embraces all others, and is the most satisfactory. "It is often argued . . . that the geological formation is but little guide to soil properties, and in support of this it is pointed out that you may, on the same formation, granite for instance, get a clay here and a sand there. This objection is a valid one, but the geologist does not argue that a geological formation should be uniformly covered with one type of soil. He admits types, sub-types, and varieties. He maintains that, under similar conditions, similar soils are produced. . . . We have abundant evidence that even though numerous minor local soil varieties may exist on any one geological formation, when all the agricultural soil analyses from any one formation are averaged and compared with an average of the analyses of the soils of another formation, there is a figure obtained which represents the average soil composition of that formation, and which may be regarded as the composition, chemical and mechanical, of the type soil of that formation."

The problems thus instructively and clearly stated and treated are numerous indeed. Reference has been made to forest flora as an indication of the quality of the soil. It is a subject of perennial interest to the farmer, but

we can only touch upon it here. Dr. Jensen remarks, on page 181, that "the white box (*Eucalyptus hemiphloia*, var. *albens*) is so distinct in its habitat that it deserves, for this reason alone, to be ranked as a different species. At the Wagga Experiment Farm the white box and the black box occur within a few hundred yards of one another, but never encroach on each other's domain, the former keeping on the sandy pervious granite soils, the latter on clayey, impervious detrital soils. The black box, like the Sydney box, seeks the heavy clay of poor capillary power. The white box is the characteristic tree of the granite areas of the western slopes; it inhabits loose, well aerated, pervious soils of a loamy or sandy texture. *E. hemiphloia*, from its partiality for droughty clay shale soils in the Sydney district, appears to be a western timber that has crossed the range. *E. albens* must have diverged from the original *E. hemiphloia* a long period ago, to account for its fixity in habit."

In a chapter entitled "Humus, Bacteria, Vegetation, &c.," reference is made to the deterioration of the grazing land of the South Coast as an illustration of the value of humus, even in relation to such an industry as dairying. "Where once the best fat cattle for Sydney market were produced, now bone chewing (*Osteo-malacia*) prevails, and the beasts are puny." This is "due largely to the destruction of the humus of the soil by the following processes:—(*a*) The ringbarking and clearing of the land, so that falling bark and leaves no longer contribute to the humus supply. (*b*) The eating down of the grass, which formerly was largely restored to the soil. (*c*) The trampling of the ground by cattle, which causes the puddling of the clayey constituents of the soil, and makes the land infertile, while at the same time the exposure of the ground to the burning rays of the sun causes the dry rot and oxidation of the organic matter, and the destruction of the humus-forming substances."

We have quoted thus liberally for the purpose of illustrating the numerous directions in which this most valuable book touches issues, both scientific and practical.

Dr. Jensen was engaged for three years in the Chemist's Branch of the Department, systematising and correlating the analyses of farmers' soil that had been made in the preceding twenty years, and in examining the samples he himself had collected during personal tours of large areas of the State. The result is that he is able more clearly to define the various types of a soil that occur in the State, and to refer them to their geological origins, with greater confidence and accuracy than has, perhaps, yet been done in any part of Australia. His book will prove a valuable text-book on soil geology generally, but it is also a contribution to the practice of agriculture in New South Wales, and deserves attention, not less from every farmer who is intelligently interested in the soil than from the student of geology and chemistry.

The work is profusely illustrated, many of the plates being exceptionally well produced, and it has the advantage of a number of maps, specially designed to indicate geological and meteorological conditions in the State.

[Published by the Government Printer. Price: cloth, 5s.]

Conformation as a Guide in Selecting Good and Bad Layers.

JAMES HADLINGTON, Poultry Expert.

THE selection of laying hens has been almost exclusively confined to the use of trap nests, single pens, and systems more or less mechanical and limited in their application. On the other hand, selection by type and conformation and other visible signs are little understood, and have been almost wholly neglected. Obviously the trap nest and single pen are limited to a small number of birds, and their use is thus of necessity confined to the selection of breeding stock. Their utility is still more narrowed down, and made even more wasteful in effort, by the fact that in most cases no selection is made of the pullets to be so tested, consequently at the end of the test the rejects or poor layers are altogether out of proportion to the effort made, when compared with what would have been the case if selection, in the first place, had been made on the lines of type and conformation before submitting them to these expensive tests.

Whatever benefit may be derived from ascertained tallies by means of single pens and trap nests in regard to testing for breeding stock, as has already been stated, these means have such limitations as to render them impracticable for flock testing, and a simpler and more rapid method of selection must be adopted.

In my inspection of these different means of testing, including those penned by competitors in the single pen tests, and also in the "test of judgment" section in the Hawkesbury Agricultural College laying competition, it is quite obvious to me that, were type and conformation, and visible signs generally, properly understood, a very large portion of the pullets would not be submitted by their owners to a mechanical test, involving as it does much labour and expenditure on plant, covering a period of twelve months' work, and a portion of the useful life of the hens.

It should be understood that I am not here under-valuing the aid to selection afforded by some of the systems offered to the public. Most of them are of more or less educational value when properly understood, but do not take into account the visible signs which I here wish to refer to, but any one of these methods of selection that have proved of value, when applied, will only assist to confirm what is here sought to be impressed, by means of these illustrations of the signs of type and conformation of good layers, as contrasted with those of less profitable birds.

Unfortunately, a tremendous fallacy has come to be accepted by many poultry-keepers in regard to tested layers, insomuch as they have come to look upon breeding from tested stock as the only means of selection and perpetuating desirable qualities, regardless of the fact that selection is almost of equal importance to that of blood, and breeding without selection is not likely to attain the desired end.

In order to bring this fact prominently before poultry-keepers last year, photographs were secured of the worst, and one of the best, layers in the single pen test at the Hawkesbury Agricultural College laying competition, and published in the *Agricultural Gazette.* This year the demonstration is being carried further, and I have secured other photographs, which are here reproduced, together with the two taken last year. While it is intended to carry this demonstration still further, it is thought that these photographs furnish sufficient evidence on the question of type, conformation, and visible signs generally, backed as they are by results obtained in the single pens, to warrant their publication, with comments thereon. Hints on selection of layers by type, conformation, and head points have already appeared in these columns, but in view of the publication of these photographs, they are repeated for the purpose of comparison with the illustrations, which will help to make them more intelligible and emphasise their bearings upon a subject which is all-important to poultry-keepers.

Points in Selection.

Pullets to be selected should not be less than 6 months old.

Points.

Head—Fairly long, and rather narrow.

Face—Long and deep, fine in texture, and free from wrinkles.

Comb—Of medium size, without coarseness.

Eyes—Large, bold, and expressive.

Neck—Fairly long, and not too thick.

Body—Rather long, carried well up from the horizontal, symmetrical, and well proportioned.

Legs—Proportionate in size to the bodily development.

The above description is intended to portray the breed here commented upon (White Leghorns), but as a matter of fact is applicable to the laying type of fowl generally.

The head of any breed is undoubtedly the best visible index to a layer of that breed. It should indicate activity and alertness. Any coarseness in face and comb, particularly if accompanied by a thick skull and heavy eyebrows, is a sure indication of an indifferent layer.

This subject of selection of layers is of special importance at the present time, owing to the high price of feed. It would be of immense value to poultry-keepers to possess a knowledge of selection, which would enable them to weed out the unprofitable factors in their business, and thus reduce their feed bills without materially reducing the egg yield. This can be accomplished without waiting for the results of a slow testing process, or in the case of the "systems," for the hen to arrive at the stage of development necessary for testing, which in some cases might entail months of unprofitable and useless feeding.

In order to illustrate the points more clearly, the photographs taken of the birds have been left untouched, and have been reproduced as such.

Head of Hen which laid 219 eggs, Single Pen Test. Hawkesbury Agricultural College, 1913–14.

Head of Hen which laid only 23 eggs, Single Pen Test. Hawkesbury Agricultural College, 1913–14.

Head of Hen which laid 262 eggs from 1st April, 1914, to 24th February, 1915. Single Pen Test. Hawkesbury Agricultural College.

Head of Hen which laid 240 eggs from 1st April, 1914, to 24th February, 1915. Single Pen Test. Hawkesbury Agricultural College.

CONFORMATION AS A GUIDE IN SELECTING GOOD AND BAD LAYERS.

Head of Hen which laid 189 eggs from 1st April, 1914, to 24th February, 1915. Single Pen Test. Hawkesbury Agricultural College.

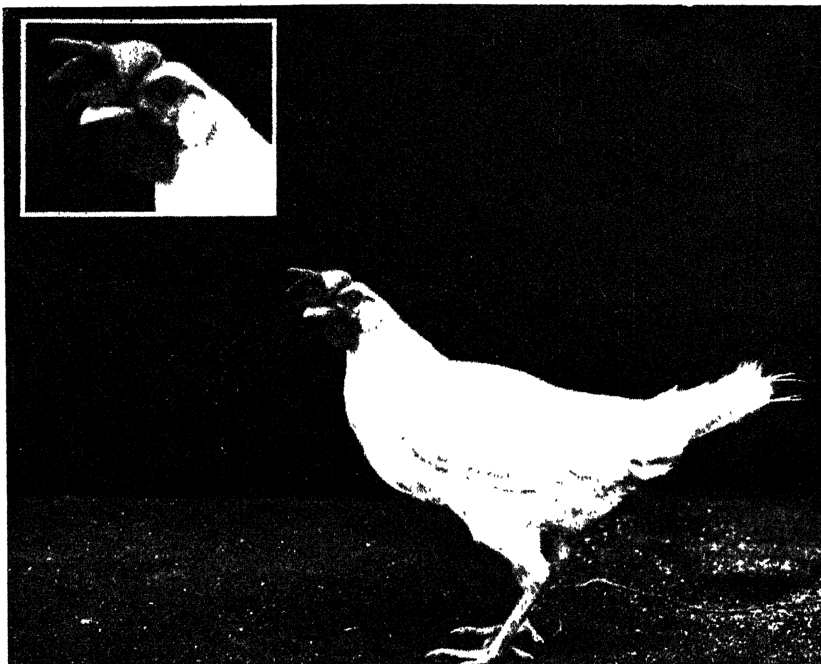
Head of Hen which laid only 10 eggs from 1st April, 1914, to 24th February, 1915. Single Pen Test. Hawkesbury Agricultural College.

CONFORMATION AS A GUIDE IN SELECTING GOOD AND BAD LAYERS.

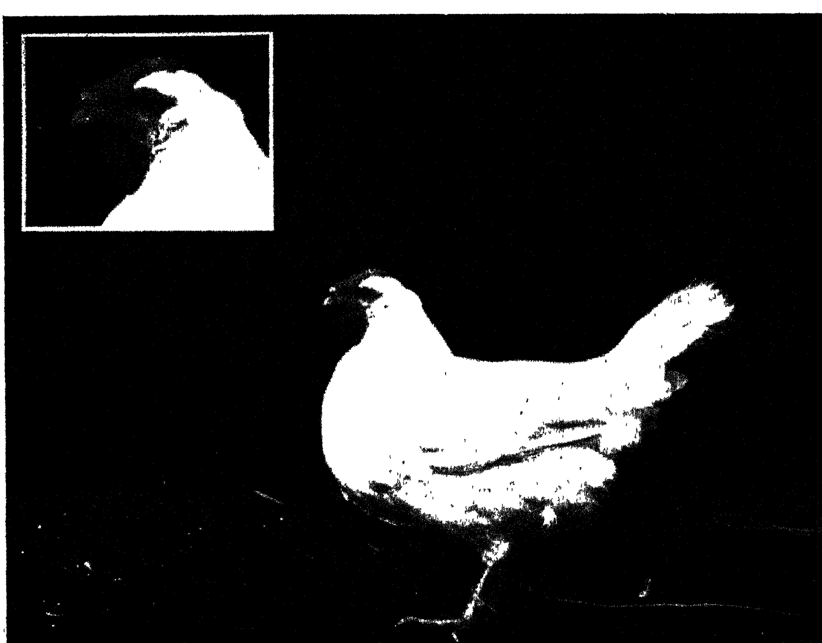
White Leghorn Hen which laid 219 eggs, Single Pen Test. Hawkesbury Agricultural College, 1913-14.

White Leghorn Hen which laid only 23 eggs, Single Pen Test Hawkesbury Agricultural College, 1913-14.

CONFORMATION AS A GUIDE IN SELECTING GOOD AND BAD LAYERS.



White Leghorn Hen which laid 262 eggs from 1st April, 1914, to 24th February, 1915. Single Pen Test. Hawkesbury Agricultural College.



White Leghorn Hen which laid only 10 eggs from 1st April, 1914, to 24th February, 1915. Single Pen Test. Hawkesbury Agricultural College.

CONFORMATION AS A GUIDE IN SELECTING GOOD AND BAD LAYERS.

Poultry Notes.

JAMES HADLINGTON, Poultry Expert.

March.

The next three months constitute, perhaps, the most trying time of the year for the poultry-keeper, especially the beginner. Hens over a year old are in various stages of moult, and last season's pullets will not as yet have produced many eggs, consequently the egg yield is a constantly diminishing quantity. The bulk of surplus stock will have been disposed of, and, therefore, income will necessarily be on a low scale, while expenditure will have to be maintained. Outgoings this year are likely to be abnormal in proportions, owing to the high price of feed. The poultry-keeper who can make ends meet at this season of the year, even in normal times, is in a happy position, and his prospects may be considered good. But I fear that there are many who will not be so fortunately placed, and it is principally for their encouragement that this review of the position is intended.

A great many beginners struggling in their first and second years get discouraged when this stage is reached, and either lose heart and abandon poultry-keeping altogether or get so dismayed as to seriously hamper their prospects. This is particularly the case if they have been buoyed up by the optimistic kind of literature that paints poultry-keeping in rose-hued colours, which assumes that a constant supply of eggs is assured by what may be termed poultry-keeping "strategy" in forcing old hens into early moult, and bringing them on to lay again early, and where pullets are hatched at different times of the year, to ensure a constant supply of eggs. But it is at this season of the year that the disillusionment comes; the beginner finds that these conditions fail to materialise, his disappointment is acute, and only too often he casts about in every direction to find a remedy for his supposed trouble, which only increases his embarrassment; he comes to the conclusion that he has either the wrong breed or the wrong strain, that his methods are wrong, or that something untoward has happened his flock.

It should, of course, be understood that some of these factors may be very real, and all may be contributing to a reduced income and less successful operations. The main point to be remembered, however, is that only those who have had extensive experience, possess aptitude for the business, and have good flocks, well reared and skilfully fed, can hope to carry through these three months without some leeway, even in normal times.

"To be forewarned is to be forearmed." It is well for the beginner to realise what to expect from his operations at different periods of the year, and in order that he may do this, it may be stated that in actual practical

poultry keeping on a normally stocked farm, with chickens hatched at the right time of the year and everything done that experience and forethought can suggest, the egg-yield will still be a decreasing quantity from October to May, and an increasing quantity from that month to October, and that the largest income from this source will be from August to November, while eggs are cheap. The beginner who looks for big egg cheques while eggs are high in price is invariably doomed to disappointment. There are, of course, exceptional experiences of this sort with small flocks which may occur under special circumstances, which are well understood; but nothing yet discovered, or likely to be, will ensure these experiences being repeated at will; and the assertions often made that a certain breed or strain of a breed can be guaranteed to lay when eggs are scarce, should be treated on a par with assertions made regarding 100 per cent. hatches. They are possible, but not probable, and should never form the basis of any calculations.

Culling.

Present conditions all point to a period of dear feed for some months to come, and much doubt exists among poultry-keepers as to the extent to which they should cull their flocks. I have already pointed out that hens that might pay to keep when it was costing at the rate of about 6s. per annum to feed, might under prevailing high prices of feed be a losing proposition. The difficulty here encountered is, that but a small portion of poultry-keepers have the necessary experience to enable them to weed out the unprofitable birds, and in many instances are not too sure about their age.

Many are more or less reluctant to cut down their flocks—a feeling that can be readily understood, because it is by no means a simple task to work up a flock of layers, as is generally supposed. Nevertheless, this aspect of the situation is vital, and should be faced, because, unlike longer-lived stock, it will not pay to keep hens to another season, when feed might be cheaper, because in the meantime the profitable life of the hen has passed. This matter of knowing definitely, and being able to recognise the different ages and conditions, is of vital importance at any time, but particularly in a time of stress like the present. Whatever excuse there may be, through inexperience, in not being able to select the good from the bad layers, there ought to be none about the different ages. If every season's pullets were marked, there would be no doubt under this head, as is seen on many farms at the present time, and which mitigates against a proper culling down of the stock, to meet the exigencies of the present situation. System is what is required; each season's pullets may be easily marked with a simple band. A quantity of these bands can be made in a few minutes, and at nominal cost; there is no need for date or numbers on them for ordinary flock markings. The method of making these bands is to procure a quantity of No. 12 or 14 copper wire, wind this round a bolt or a peg of round wood, the size required. When pulled off it will appear like a column of spiral spring; cut this column up the centre with a pair of snips, and it will all fall into rings, which can simply be slipped on to the bird's leg.

As an example of distinguishing one season's hatching from another, the following plan could be mentioned:—

Band on right leg	...hatching season,	1913.
„ left „	„	1914.
Without band	„	1915.

As hens should be disposed of after the second year's laying, bands in the same order could be repeated. In the case of any special birds retained for stud purposes, these could be marked with coloured celluloid rings or numbered bands. Pullets need not be marked until they are from 7 to 9 months old, or at any time prior to their assuming the appearance of older hens.

The profitable life of a hen may, for all practical purposes, be set down as from 27 to 30 months old, although there are often as many as 20 per cent. worth keeping twelve months longer under cheap feed conditions, when one has the necessary experience to select them; but on any well-stocked farm the largest portion of the laying stock should consist of pullets in their first year on 1st April. If this is not the case, the returns are likely to be proportionately poor in the ensuing winter, because comparatively little egg production before the spring can be expected from hens over a year old. The first fifteen to eighteen months of a hen's life are the most profitable, the next twelve months are less so, and after that something like 80 per cent. cease to be profitable as layers even under normal conditions.

Early Moulting.

How can the hens be made to moult early, so that they will come on to lay early? is a question often propounded. It may be said that this is only practicable up to a certain point; it does not follow that the hen which gets through her moult early in the summer will commence to lay again early, and continue to do so. The fact is that the very early moulters are, for the most part, poor layers; not only so, but instead of coming on to lay early, they very often fall into another partial moult on the first touch of winter. It will thus be seen that, even if there was much of a practical nature about forcing them into early moult, it is not bound to be followed with satisfactory results, while very often the reverse is the case. The same may also be said about notions of forcing pullets into early laying. Such "get-rich-quick" notions are generally heavily discounted by Nature, and the beginner who shuns all such, and follows along the lines of common-sense and seasonable expectations, is the least likely to meet with disappointment.

Agricultural Bureau of New South Wales.

NOTES COMPILED BY H. ROSS, Chief Inspector.

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Dunedoo	Mr. V. A. Florance (*pro tem*), Dunedoo.
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Grenfell	Mr. G. Cousins, Grenfell.
Gunning	Mr. E. H. Turner, Gunning.
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Milbrulong	Mr. O. Ludwig, Milbrulong.
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Narrandera	

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Ringwood	Mr. Wm. Tait, Ringwood.
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Sackville	Mr. Arthur Manning, Sackville.
Sherwood	Mr. J. E. Davis, Sherwood.
Stockinbingal	Mr. J. Neville, Stockinbingal.
St. John's Park	Mr. J. C. Scott, St. John's Park.
Tallawang	Mr. G. Lincoln, junior, Tallawang.
Taralga	Mr. Dave Mullaney, Stonequarry, Taralga.
Tatham	Mr. J. J. Riley, Tatham.
Temora	Mr. J. T. Warren, "Mortlake," Victoria-street, Temora.
Toronto	Mr. J. G. Desreaux, Esmond, Toronto.
Tumbarumba	Mr. R. Livingstone, Tumbarumba.
United Peel River (Woolomin).	Mr. C. J. MacRae, Woolomin.
Upper Belmore River ..	Mr. A. W. Fowler, Upper Belmore River, *viâ* Gladstone, Macleay River.
Uralla	Mr. E. A. Neil, Uralla.
Valla	Mr. A. E. T. Reynolds, Valla, *viâ* Bowraville.
Wagga	Mr. Thos. Fraser, Aberfeldie, Wagga.
Walla Walla	Mr. H. Smith, Walla Walla.
Wallendbeen	Mr. W. J. Cartwright, Wallendbeen.
Walli	Mr. Geo. Edgerton, Applewood, Walli.
Wetherill Park	Mr. L. Rainbow, Wetherill Park.
Wollun	Mr. Robert Turner, Wollun.
Wolseley Park	Mr. H. McEachern, Wolseley Park.
Wyan	Mr. C. W. Harper, Myrtle Creek Railway Station.
Wyong	Mr. Edgar J. Johns, Wyong.
Yass	———————
Yetholme	Mr. N. D. Graham, "Bona Dea," Yetholme.
Yurrunga and Avoca ...	Mr. W. H. Waters, Yurrunga.

REPORTS AND NOTICES FROM BRANCHES.

Balldale.

At a meeting of this branch, held on 21st January, Mr. L. Maxwell delivered a very interesting lecture on wheat breeding, which was greatly appreciated by members.

Batlow.

On Wednesday and Thursday, 2nd and 3rd December, Mr. J. G. R. Bryant, Assistant Fruit Expert, drove round this district in company with the Secretary of this branch of the Bureau, visiting as many of the orchards belonging to members as possible. His visit was greatly appreciated, and did a lot of good, as the orchards are just now reaching a critical stage, when they need proper attention and scientific treatment.

FRUIT CULTURE IN THE BATLOW DISTRICT.

Mr. Bryant was struck with the suitability of the district for pears and apples, but diseases should be watched and proper cultivation adopted. He also thought peaches, grapes, and English plums should be planted more exten-

sively, the first two fruits coming into bearing before apples and pears, and thus helping the orchardist over the first few years. Both would bear a good crop for the fourth year, grapes especially so.

The varieties recommended were:—

Peaches.—Red Italian, Comet, Elberta, Salway.
Prunes.—Prune d'Agen, Robe de Sergeant.
Plums.—Angelina Burdett, Grand Duke, President, Pond's Seedling, Giant.
Pears.—Williams, Packham's Triumph, Howell, Josephine de Malines, Beurre de Capiaumont, L'Inconnue, Winter Cole, Beurre Bosc.
Apple.—Jonathan, Granny Smith, London Pippin, Gravenstein, Sturmer, Pomme de Neige, Lord Wolseley.
Grapes.—White Muscat, Black Muscat, Doradillo.
Cherries.—Early Lyons, Biagarreau Napoleon, Florence, St. Margaret.
Apricots.—Hemskirke.

The necessity for securing a good easterly or northerly aspect, well sheltered and well drained, was emphasised. Cherries and prunes, especially, should be on well-drained ground. Wind-breaks of the natural timber should be left, if possible, otherwise they should be planted. Pines were the best.

Mr. Bryant met the growers on Thursday night, and delivered an interesting and instructive lecture, in which he narrated his experiences in driving round, and showed the growers just where they were a little at fault in trusting too much to their fertile soil and usually abundant rainfall, and omitting to cultivate properly. He answered numerous questions, and threw light on several knotty problems.

Beckom.

A number of members of this branch met recently. Mr. Peter Grant has been appointed Hon. Secretary, *vice* Mr. S. Stinson, who has left the district.

Blacktown.

The second monthly meeting of this branch was held on 2nd February in the Blacktown School of Arts, Mr. T. J. Main presiding. The treasurer reported that the branch had a credit of £3 10s. Six new members joined.

A paper on water conservation was read by Mr. R. H. Lalor, in which were made some practical suggestions for sinking wells for domestic and other purposes.

Borambil.

The annual meeting of this branch was held on 27th January. The Treasurer's balance-sheet showed a credit of £2 11s. 3d., in addition to subsidy amounting to £2, now due to the branch.

In reporting on the operations for the year just ended, the Secretary stated that eight ordinary meetings and one special were held, and in addition lectures were delivered by departmental officers.

The average attendance at meetings was much better than in the previous year, and taken as a whole it was considered that satisfactory progress was made during 1914.

The election of office-bearers resulted as follows:—Chairman, Mr. G. D. Porter; Vice-Chairmen, Messrs. A. C. Garland and E. J. Rixon; Treasurer, Mr. A. Pengilley; Hon. Secretary, Mr. H. A. D. Crossman.

Two new members joined.

Canadian.

The annual meeting of this branch was held on 6th February.

The branch was formed on 11th October, 1913, with a membership of fifteen, and the Secretary's report showed that this had increased to twenty-

four. Nine meetings had been held during the year, at each of which papers had been read by members, and one lecture had been delivered by an officer of the Department of Agriculture.

The following officers were elected:—Chairman, Mr. F. S. Stacy; Vice-Chairman, Mr. R. Hollow; Treasurer, Mr. C. Hamilton; Hon. Secretary, Mr. F. W. Taylor.

Coonabarabran.

The annual meeting of members of the above branch was held on 5th February.

The Secretary's report showed that there had been a good attendance at all meetings up to the May meeting; but since then the attendance had fallen off. Papers had been prepared by a number of members, and discussed at the meetings. and one address had been delivered by an officer of the Department. Seed corn had been purchased by the branch and parcels distributed to members, while samples of cereals had been supplied by the Department and samples of local wools by the P. and A. Association.

The Treasurer's balance-sheet showed a very satisfactory state of affairs, the membership being seventy-nine and the credit balance £5 0s. 3d.

The following officers were elected for the ensuing year:—Chairman, Mr. D. Hagan; Vice-Chairmen, Dr. Failes and Messrs. W. Parkins, W. Liebentritt, and G. J. Douglas; Treasurer, Mr. W. Parkins; Hon. Secretary, Mr. H. H. Moss.

It was decided to hold the meetings on the first Saturday in each month. Paper for discussion at next meeting—"Strengths of Wheats," by Mr. G. C. Failes.

Cundumbul and Eurimbla.

The monthly meeting of this branch was held on 1st February, when there was a good attendance of members. Mr. F. H. Bisley tendered his resignation as Chairman, owing to removal from the locality, and Mr. M. J. Hall was elected to fill the vacancy. Three new members joined the branch.

Members were much interested in a paper on the cultivation of broom millet, which was read by Mr. J. Berney.

Broom Millet Culture.

The first thing is to plough the ground well, and it should be early, say June or July. Let it lie till the winter rains are over, and then harrow it down. At seeding time run the cultivator over it, or if there are many weeds, a light ploughing is necessary, and work it down to a fine tilth. Sowing should commence about the middle of September, or when the danger of frosts is over. The seed should be planted in rows 2 feet apart, and from 4 to 8 inches apart in the drills. It can be sown by hand or by machine. The most difficult part of the work is to sow it thin enough. After this the cultivator or harrow should be run through it frequently to keep the surface loose and check the growth of weeds. There are many varieties of broom millet, but White Italian is most suitable for this district. I do not think it necessary to bend down the heads in this district as they do in coastal districts, where the heads grow much heavier.

The time for cutting depends upon the weather and the colour required. Manufacturers generally prefer a millet having a green tinge. It is then much tougher than when allowed to become nearly ripe. To obtain this green

colour the millet should be cut when the seeds are in what may be called the dough stage. For some classes of goods a golden colour is preferred. A strong knife or share blade is used for cutting, and at least 6 inches of stalk should be left on the brush.

The millet is left to dry in the field for a couple of days after cutting, and it can then be carted in, and is ready for threshing. It should not in any case get wet after cutting, as it will lose its colour.

The seed is removed by means of a hackler. The machine consists of a roller studded with small iron spikes mounted on a frame, and made to revolve at high speed. A handful of the brush is held so that the roller comes in contact with the seed, which is quickly stripped off. These machines are made to be driven by hand, horse, or steam power.

Baling is done by putting the brush with the butt end outwards, and the heads overlapping in the middle, and battens are placed on top and bottom, and four or five wires put around them. For a small lot, a temporary press can be made by putting four posts in the ground and using a long sapling for a lever. Broom millet fits in well with mixed farming, as it comes in early. The yield ranges from 5 to 10 cwt. per acre, and the price from £20 to £40 per ton.

Fernbrook.

A practical demonstration of the use of explosives for clearing was given by Mr. C. W. Burrows, Assistant Inspector of Agriculture, on Mr. J. Monaghan's farm, on 22nd January, when there was a good gathering of residents. Mr. Burrows carefully explained in detail the use and the dangers of explosives. He recommended that the stumps be first shattered and then burnt, on account of the scrub trees having all surface roots, whereas forest trees have tap roots. All present were deeply interested in the work.

Mr. W. Le Gay Brereton, Orchardist of Glen Innes Experiment Farm, gave a practical demonstration of summer pruning and thinning of fruit-trees, at Mr. W. Caffery's orchard, on 23rd January. There was a large gathering of residents. Mr. Brereton explained the varied treatment required for different varieties, and the correct time for attending to the trees. After the pruning, Mr. Brereton gave a practical demonstration of budding fruit-trees, which proved quite an object-lesson to the majority of those present.

The members, through the Secretary, have expressed high appreciation of these demonstrations.

Inverell.

At the monthly meeting of this branch, on 29th January, Mr. A. E. Sweaney, manager of the Inverell butter factory, read a most interesting paper on the benefits of testing, backing his remarks up by the results of experiments personally conducted by him during recent years. This will be referred to at length in the April issue.

Leech's Gully.

A lantern lecture on poultry-farming was delivered by Mr. J. Hadlington, Poultry Expert, to members of the above branch and the Tenterfield Poultry Club, on 18th January last. The lecture was well attended, and those present were very much impressed with the evening's instruction.

Meadow Flat.

A paper, from which the following extracts are made, was read by the Secretary (Mr. Fred. J. Brown) at the meeting held on 6th February:—

Insect and Fungus Diseases of Fruit-trees.

One of the worst pests met with in the apple orchard is the codlin moth, but it is easily controlled with a little care and intelligence. The moth is about half an inch long, and not more than 1 inch across the outstretched wings. It is of a greyish-brown colour, with the tips of the forewings marked with copper-coloured bands, which give it a distinctive appearance. It is not seen very often unless one knows just the kind of place it rests in during the day time, as, owing to its likeness to the bark, it is hard to distinguish. The first brood of moths emerge somewhere near the time the trees burst into bloom, and lay their eggs upon any part of the fruit or foliage, but the grubs make straight to the calyx of the blossom. These grubs are shut in the fruit when the calyx closes, and they arrive at the full-grown stage when the apple is about a quarter grown. They then eat their way out through the side of the fruit, and if the apple does not fall, as it very often does, the grub spins a silken thread and lets itself down to the ground. It then crawls away, climbs up the first tree trunk it finds, and makes a fine silken cocoon in a sheltered place, where it changes into the chrysalid state. The chrysalis, if left alone, will breed out the second brood of moths in about ten days' time if the weather is favourable. This second brood lay their eggs almost anywhere on the apples or foliage, and the grubs, when hatched, eat their way into the apple, and often eat the foliage. The same process goes on again, and if the summer is a dry one, a third brood are hatched, but this does not happen often in this district. The last brood, however, find a good place, and there they stop in the chrysalid state till the trees bloom in the following spring, when the process is repeated. It has been computed that each female moth can lay from fifty to eighty eggs, so it is a matter of simple arithmetic to see to what number one moth can breed in three years.

Under the "Fruit Pests Act" it is compulsory to spray with an approved brand of arsenate of lead, but anyone who is in sympathy with the objects of the Bureau ought to be glad to do the spraying, not only for his own particular benefit, but for that of the district. I spray, if possible, any time from the sixth to eighth day of blossoming. After this time the calyx closes, and spraying is useless. The object of spraying is to get a particle of the arsenate in the calyx, so that the grub may eat it and die. Spraying has to be carried out for each brood of moths. Fruit well sprayed should not have more than 5 per cent. affected with codlin moth.

The next pest that troubles young trees in this district is red mite, though not to any great extent. This insect hatches from tiny round red eggs, which may be seen clustered at the junction of the branches with the trunk, or in any broken part of the bark. When the trees burst into leaf the insects hatch and attack the leaves, which become mottled with yellow, the mites having sucked the juice. Lime-sulphur is the best spray.

The next species of pest is the woolly aphis. It is very troublesome in old orchards, which are mostly planted on non-resistant stocks. It is the best plan to plant only trees grafted on Northern Spy or Majetin stocks. These two varieties are immune to the attacks of the pest. If the branches become affected, spraying with red oil emulsion in the winter, or tobacco wash in the summer, is effective, but the spray must be applied at very high pressure. Smearing the affected parts with salad oil is also good, but not practicable on large areas.

A pest that causes a lot of damage to the tree is mussel scale, so called from its shape, which is like the shell of the mussel. The tiny shells may be seen sticking to the bark of the trees in countless numbers. If the shell is lifted, it will be seen to cover a cluster of semi-transparent eggs, which hatch out in spring, and the aphides, with their sharp-pointed beaks, commence to suck sap from the tree, causing it to wither, and the leaves to fall off. Spraying with red oil emulsion in winter, and lime-sulphur in summer is effective, but the pest is very difficult to eradicate. The bark on the trees should be scraped with a blunt tool before spraying, as these scales cluster under the loose pieces.

Next comes the fungus disease known as "Black Spot." This is one of the commonest diseases of the apple, for which the best spray is either lime-sulphur or Bordeaux mixture. The trees should be sprayed just before the buds burst, and about ten days after the fruit has set.

Pears have many diseases which the sprays mentioned above will cure, and it is advisable to give the pear-trees a dose of spray when doing the apples.

This year has been particularly bad for aphis and leaf-curl on peach-trees, and if any of your trees are affected I would advise you to try lime-sulphur or Bordeaux mixture. There are many other diseases of the various fruit-trees, but those mentioned are the worst in this district.

Fruit well sprayed is fruit half sold. Do not grudge the time or money expended on spraying. Always remember, for aphis, woolly aphis, and scale, you require a spray that will smother them. You cannot poison them. Arsenate of lead or any other arsenical compound is only good for codlin moth, caterpillars, grubs, beetles, and such insects as actually eat the leaves.

Fungus diseases are controlled by lime-sulphur or Bordeaux mixture. If any of you have a few trees I would advise spraying, just for experimental purposes, and you will be surprised at the result obtained in one year.

The following is a good spraying calendar for this district:—

June.—Red oil for woolly aphis or mussel scale, &c.

End of September.—Lime-sulphur or Bordeaux mixture for black spot and lime-sulphur for mussel scale.

Second week in October.—Arsenate of lead for codlin moth.

Second week in November—Bordeaux mixture for black spot, arsenate of lead for codlin moth, lime-sulphur for mussel scale.

December.—Arsenate of lead for codlin moth.

Miller's Forest.

On 16th December, Mr. F. Wigan, Dairy Instructor, gave a lecture at Miller's Forest. There were twenty-five farmers present, chiefly members of the local branch of the Bureau. Mr. James Priddle (Chairman) presided.

Dairying.

Mr. Wigan spoke of the advances made in the dairying industry during the past few years, and the great markets existing in the Old World for first-class butter, and also in America, provided good butter could be got to the latter place.

He dealt with second-grade butter and the menace it was to the butter world, and the boon to the margarine manufacturers. After explaining how margarine was produced, he said that with the addition of a little second-grade a cheap substitute for butter was offered to the public.

He then showed how dairying had advanced, and what cleanliness had produced in dairying, and how profitable was a little care. A very interesting explanation of the injurious effects of certain germs on milk and cream was given, and the lecturer also explained that those germs were produced mainly through carelessness and neglect. He produced several test tubes that contained microscopic specimens of various kinds of germs which proved ruinous to cream; one in particular was the result of bad water, and when opened it produced a most offensive smell.

Nimbin.

The second annual meeting of this branch was held on 26th December. Mr. R. Gall occupied the chair.

The Secretary presented his annual report, which showed that during the year ten meetings had been held, when useful discussions took place. The membership had been satisfactorily maintained. Discussions had taken place on a large number of subjects interesting to farmers in the district, and useful work had been done in other directions.

The election of officers resulted as follows:—Chairman, Mr. F. Cullen; Vice-Chairman, Mr. R. Gall, sen.; Treasurer, Mr. J. Wilson; Hon. Secretary, Mr. J. T. Hutchinson.

Orangeville.

The annual meeting of this branch took place on 29th January. The Treasurer read a statement of receipts and expenditure, which showed that there was a credit balance of £4 8s. 4½d., which, with the Government subsidy for the past year, would be brought up to £5 8s. 4½d.

The election of officers for the ensuing year resulted as follows:—Chairman, Mr. W. J. Moulder; Vice-Chairmen, Messrs. R. H. Taylor and W. H. Dunk; Treasurer, Mr. A. McWhirter; Hon. Secretary, Mr. C. Duck.

Mr. R. H. Taylor was appointed to act as newspaper reporter for the branch. The annual subscription was fixed again at 1s.

Ponto.

This branch held the usual monthly meeting on 2nd February, at which there was a fair attendance, and two new members were admitted.

Members were invited to collect plant and insect pests for exhibition at the next meeting.

Roberts' Creek.

A branch has been established at Roberts' Creek, with the following gentlemen as office-bearers:—Chairman, Mr. L. Small; Vice-Chairman, Mr. Jas. Flatley; Treasurer, Mr. R. Watts; Hon. Secretary, Mr. J. Cavanagh.

The formation of the branch took place on 15th January, with a membership of twenty, and the first monthly meeting was held on 3rd February.

It was resolved to visit the Grafton Experiment Farm on a date to be arranged.

Mr. G. Marks, Inspector of Agriculture, delivered the first of a series of lantern lectures on the care and management of pigs. Everything points to this being a very successful branch, as the residents of Roberts' Creek are most progressive.

Messrs. L. A. Small and Jas. Flatley are preparing papers for the two next meetings, on "Scientific Agriculture" and "Government Certification of Sires," respectively.

United Peel River (Woolomin).

A demonstration of the use of explosives in agriculture was given at Woolomin on 8th February, when there was an attendance of about thirty.

Methods of Clearing and Subsoiling.

The demonstration was carried out by Mr. C. W. Burrows, Assistant Inspector of Agriculture, who, prior to commencing operations, explained that he did not aim at blowing the trees right out, as the cost would be too great for practical purposes. The object of the demonstration was to show how to clear land with a minimum of cost. He impressed upon those present the necessity of handling explosives carefully. For safety and results he preferred gelignite, as dynamite was too dangerous for general use. Gelignite in a frozen condition was highly dangerous, and should be thawed by being placed in a vessel which in turn should be put into warm water. A farmer did not need to be an expert to take up the work, but he should make himself conversant with the use of explosives before starting.

Coming to the practical part, Mr. Burrows first operated on a White Gum tree about 5 feet in diameter. Seven holes were made with augers preparatory to inserting the charge, and seven primers were then fitted with detonators

and insulated wires. In all twenty-six plugs of gelignite with primers were placed in the holes. The plugs were first gently compacted in the holes, after which the primer, with detonator, was placed in position, and the hole tamped with moist earth. The wires were connected right round the tree, the whole was connected with an electric cable about 100 yards long, and then attached to an electric battery and all the shots let off simultaneously. The tree was shattered to pieces, so that it would burn rapidly. A green apple tree, about 3 feet 6 inches in diameter, was next operated on, one hole being bored into the centre of the tree, and eight plugs of gelignite placed therein. Detonator and fuse were used, and resulted in the tree being shattered right through.

It was explained by Mr. Burrows that each hip-root, of which there were some six or seven, could be similarly bored and shattered with small charges fired with detonator and fuse. This system could be advantageously used where farmers did not wish to go to the expense of obtaining a battery outfit.

Mr. Burrows afterwards gave a successful demonstration in subsoiling, and explained that it had been found very successful in orchard work.

The monthly meeting was held after the demonstration. A lengthy discussion took place on the use of explosives for clearing and subsoiling, and the general opinion was that the system would save a great deal of time and labour.

Wollun.

The usual monthly meeting of the above branch was called on the 6th February, but owing to unfavourable weather the attendance was small. The branch has now a membership of twenty-one, and everything augurs well for the current year.

Yetholme.

This branch held its monthly meeting on 30th January. There was a good attendance of members. The meeting was a short one, having to be held in the open air, as no hall was available. It is proposed, however, to ask the Department of Public Instruction for permission to hold the regular monthly meeting in the local school hall, when it is anticipated that the branch will become more active.

Yurrunga and Avoca.

The monthly meeting of the above branch was held on 13th February, at Avoca, where there was a good attendance of members.

The Secretary was instructed to write to Mr. J. Gilbert, a successful local farmer, asking him to give an address at next meeting on the best and most profitable lines on which to run a farm of 100 acres in the district.

The Chairman initiated a discussion on the advantages of soaking seeds preparatory to sowing, more especially maize. A highly instructive conversation ensued, which brought to light some most important results obtained by a local farmer, proving that under certain conditions soaking was beneficial. It was asserted that experiments went to show that by soaking maize for twenty-four hours preparatory to sowing, provided the seed-bed was in a moderately moist condition, the ripening period was hastened by some four weeks—a result which is of the greatest importance in a district where the summer is in some seasons too short to ripen maize satisfactorily.

Orchard Notes.

W. J. ALLEN.

MARCH.

Cultivation.

WHEREVER the weeds have been allowed to grow unchecked, they should be turned under some time this month, and if crops for green manure—such as grey field peas, tares, rape or rye—are to be sown among the trees, they should be put in as early as possible. If, however, no crop is to be sown, it would be well to allow the land to remain in the rough state after ploughing. It will gradually mellow down and remain in good condition until it is time to plough again next spring.

Provision should be made for furrows to carry away storm waters and prevent washing of the soil. In citrus orchards particularly, open furrows should be left to carry off any surplus waters, on account of the assistance given in draining the land.

Citrus trees at this season of the year should be kept free from excessive moisture about the roots. The lack of drainage in many of our citrus orchards seems to be the underlying cause of many fungus and other troubles.

Grading and Packing Apples and Pears.

There is a particularly heavy crop of apples and pears throughout our main tableland and highland districts. It is very necessary that growers should endeavour to have their fruit packed in a uniform manner, and for that purpose the diagonal system of packing should be adopted.

The chief points in grading apples are :—Size, colour, freedom from disease, and uniformity through every case.

The market generally demands a good, clean, medium-sized fruit, 2½ inches being about the ideal, as the buyer generally wants what to the trade is known as a good count. Extra large fruit is not desirable, as these are generally coarse, and do not keep so well. When grading, any fruit which shows the slightest sign of disease should certainly be thrown out.

It is impossible to overestimate the importance of grading apples for market. It is a thing which cannot be overdone. Most fruit is practically unsaleable without grading, and the better the grading the better it sells.

At our Bathurst Government orchard, when packing apples the following grades are adopted :—

Extra Choice—3 inches to 3½ inches.

Extra fine specimens only, uniform in size, colour, and form, and without blemish.

Choice 1st—$2\frac{1}{2}$ inches to $2\frac{7}{8}$ inches.

Good fruit, not so fine as Extra Choice, uniform in size, colour, and form, and practically free from insect injury, or defect.

Specially selected 2nd—2 inches to $2\frac{3}{8}$ inches.

Mostly good eatable fruit, uniform, and not conspicuously marked by insects, fungi, or other damage.

Every grower's pack should be as good as his bond; there should be no topping up, nor filling up corners with small apples. Buyers want honestly packed goods, and they are usually willing to pay good prices for such. Each case should be filled with the same grade throughout; a few seconds or culls scattered in with a lot of prime fruit give the buyer an opportunity to discriminate against the whole package, and ruin the reputation of the grower.

Apples must be cool and dry before being packed. Heat and moisture promote decay. Each case should be well filled, with the contents placed firmly and snugly. Every day consignments are placed on the market showing evidence of careless packing. Unless the case has been well filled and packed before starting, it will reach the market in what is commonly known as "slack" condition. The numerous jarrings received *en route* to market will have caused the contents to settle and shrink, with the result that the case will only be partially full. When placing the fruit in the cases it is found that the diagonal (numerical) system of packing is the most suitable. The packing under this system is known as the 2-1, 2-2, or 3-2 packs. In most cases the apples should be placed on their sides (cheeks) when putting them in the rows. In this way they fit more snugly and give less loss of space and, therefore, fill the case better. When adopting the numerical system of packing in the Australian bushel case, it will be found that with the grades and style of packing recommended all 2-1 packs will have five layers; all 2-2 packs, six layers; and all 3-2 packs, seven layers of fruit.

Buyers will not pay the price of full packages for those received only filled in part. Not only is the sale affected in this way, but loose packing invariably causes bruises and the general defacement of each specimen. Too tight packing must also be guarded against, as this generally results in bruising. There is a happy medium in packing that can only be learned by practical experience.

Wrapping.

Whether the apples should be wrapped or not depends somewhat on the variety and the grade of fruit. Wrapping has several advantages:—

1. It serves as a cushion in the case of delicate fruit.
2. It prevents rot and fungoid diseases from spreading from one fruit to another.
3. It maintains a more even temperature in the fruit.
4. The fruit has a somewhat more finished appearance when exposed for sale.
5. Wrappers keep the fruit firm and snug in the packages.

Disadvantages of wrapping:—

1. It adds to the cost of packing.
2. It prevents rapid cooling in cases where the fruit is not cool at the time of packing.

Harvesting.

This work will be engaging most of the time of growers of deciduous fruits and grapes. Raisin grapes and sultanas may be picked and dried. Late table grapes will be coming to market from the cooler districts. Prune drying will be in full swing, and so will the evaporation of apples and pears.

All good keeping varieties of apples and pears may be forwarded to the cool stores for later markets if prices are not satisfactory. Granny Smith apples, and Winter Cole and Winter Nelis pears are suitable for this purpose.

Fruit Fly and Codlin Moth.

It seems almost incredible that any fruit-grower who is alive to his own interests would allow fly or moth-infested fruit to lie on the ground until the grubs have left them, but it does happen, and far too frequently. It is to these careless growers that we are usually indebted for the breeding and spreading of many of our pests, and it is they, too, who give so much extra trouble to Inspectors under the Fruit Pests Act, in seeing that no neglect takes place.

Small flat tins or saucers suspended on the sunny side of the tree, and containing a small quantity of kerosene, serve as a splendid trap for the adult fruit flies on the wing. By adopting this practice growers are placing themselves in the position of minimising the source of infection. To secure the best results by this method every citrus grower should set traps as suggested.

Budding.

It is rather late, but if the month should prove a warm one, it is quite possible that buds will still take if inserted in deciduous trees which are not producing either good fruits or satisfactory crops. Nursery stock may still be budded.

Preparing Land for Planting.

Clearing, grubbing, ploughing, and subsoiling, preparatory to planting, should now be carried out soon as possible, and those who intend planting this coming winter, and who have not completed these operations, should lose no time in finishing this work, so that new land will have a little time to sweeten before the young trees are set out, as well as to enable the orchardist to complete all planting operations early in the winter.

Provided the ground is in a well worked condition, and contains ample moisture, young citrus trees may be planted this month in the coastal districts.

Apiary Notes.

March.

R. G. WARRY, Demonstrator in Apiculture.

During this month, a thorough examination of all comb, either stored in the honey room or in the hives, should be made, and any batch of comb or bits of broken comb found infested by the wax moth should be set aside for fumigation; indeed, if the moth is prevalent about the apiary, all comb not in use should be treated.

Hydrocyanic acid gas is the best poison known for killing the pest and does no injury to the comb, but its application needs some care to ensure success. Place everything infested with moth or grubs, together with any woodwork likely to have moth eggs on it, in a room which can be made reasonably airtight, by covering all cracks, openings, &c., with strips of pasted paper, while the eaves, if open along the iron roof, can be plugged up with old bagging; the whole to be placed so that the gas can reach every part of it. Infested combs can be hung in spare hives with a space of at least an inch between each, or, what is better, hung on racks from the ceiling. If combs are suspended in empty hives, the hives should not be stacked on each other, as they would be when in use in the apiary, but set out without covers, resting on battens along the floor of the room, or, if space is not available, the hives can be piled up in a tier with blocks under their corners so as to allow the gas to enter the pile and to reach every comb. Pieces of broken comb and wax that have been collected in the apiary should be spread out on a bench, on the floor, on shelves, or in any way that will allow the gas to reach the moths and grubs infesting it. The main object in fumigation is to save well-built combs attacked by the pest from being completely destroyed. Small pieces of comb and bits of wax can be melted and rendered into cakes of wax, as described in last month's *Gazette*, but if there is only a little of this, or if no time is available for melting it, the broken comb should be treated with the rest, otherwise it is sure to breed more moths.

The mixture used for generating the gas is composed of water and sulphuric acid in which a certain proportion of cyanide is dissolved. The ingredients are not expensive, but the right proportions of each must be used or the mixture will not give off a good volume of gas. 1 oz. of cyanide dissolved in a mixture of 3 oz. of water and 1 oz. of sulphuric acid will give the best results. If too much acid is used, the cyanide will become coated, and the production of gas will cease. The amount of liquid and cyanide necessary will depend on the size of the room in which the fumigation is to be carried out. As a guide, a room measuring 10 feet x 12 feet x 11 feet high will

require $1\frac{1}{4}$ lb. each of cyanide and sulphuric acid and 60 oz. of water. For containing the liquid a china or enamel vessel can be used or a kerosene tin which has been previously coated with pitch; the acid will attack tinware if not coated. Measure out the water first into the vessel to be used, have the right weight of sulphuric acid and cyanide at hand; pour the acid into the water slowly, taking care not to splash it into the hands or face, as sulphuric acid burns badly, then add the cyanide and leave the room immediately, as the gas which will begin to rise from the vessel is poisonous. The room should be locked on leaving, and not opened till next day. One fumigation will kill all moths and grubs if things have been arranged so that the gas can reach them, but it is questionable if moth eggs are killed by the gas. If a second fumigation can be given in about six days, any eggs not destroyed by the first fumigation will then have hatched and be killed by the second application.

Cyanide is bought in tins at 10d. per lb.; the tins should be kept tightly closed, as the cyanide absorbs moisture quickly from the atmosphere. Commercial sulphuric acid costs about 6d. per lb.

FRUIT AND VEGETABLES FOR THE FLEET AND TROOPS.

In connection with the appeal from the Vegetable Products Committee, referred to in our last issue, arrangements have been made by the Australian Red Cross Society, N.S.W. Division, of 215 George-street, Sydney, to take charge of all consignments forwarded for the purpose of distribution amongst the warships of H.M. fleet in the North Sea.

The Sydney Chamber of Agriculture has also made an appeal to all branches of the Agricultural Bureau in N.S.W. for donations of produce for distribution both amongst our own troops and the troops at the front, and already there has been a hearty response.

Labels have been forwarded to the various branches of the Agricultural Bureau, and all that is needed to be done is to tack the labels to the cases containing the fresh or canned fruit, jam, &c., and they will be forwarded rail free to the Produce Depôt of the Red Cross Society.

It is desired to make up a consignment of at least 500 cases of apples for the North Sea Fleet, and all who are willing to assist in this direction are asked to inform the Society as to the number of cases which can be donated. The Society will notify promptly, telling the date on which to forward the fruit, so that the whole can be shipped with as little handling and delay as possible. The movement has the hearty upport of the Minister and Under Secretary, and 100 cases of apples will be forwarded for the purpose from the Bathurst Experiment Farm Orchard.

Labels entitling the consignments to be sent rail free will be gladly supplied by the Society to any who are willing to co-operate in the movement, and donors are asked to state, when advising, whether they wish their gifts to be allocated to any particular object or prefer to leave the matter in the hands of the Fruit and Vegetable Products Branch of the Red Cross Society.

AGRICULTURAL SOCIETIES' SHOWS.

Secretaries are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 21st of the month previous to issue. Alteration of dates should be notified at once.

1915.

Society.	Secretary.	Date.
Blayney A. and P. Association	H. R. Woolley ...	Mar. 9, 10
Glen Innes & Central New England P. & A. Assoc'n ...	G. A. Priest ...	„ 9, 10, 11
Yanco A. Association	W. J. Monfries ...	„ 10

AGRICULTURAL SOCIETIES' SHOWS—*continued.*

1915.

Society.	Secretary.	Date.
Coramba District P., A., and H. Society	H. E. Hindmarsh	Mar. 10, 11
Tumbarumba and Upper Murray P. and A. Society...	E. W. Figures ...	,, 10, 11, 12
Nepean District A., H., and I. Society (Penrith) ...	P. J. Smith ...	,, 11, 12
Taralga A., P., and H. Association	G. Goodhew ...	,, 11, 12
Wauchope P., A., and H. Society	A. D. Suters ...	,, 11, 12
Mudgee A., P., H., and I. Association	P. J. Griffin ...	,, 16, 17, 18
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Government Stud Bulls available for service at State Farms, or for lease.

Breed.	Name of Bull.	Sire.	Dam.	Stationed at—	Engaged up till—
Shorthorn ...	Melba's Emblem (Vol. IV. M.S.H.B.)	Emblem of Darbalara (100 M.S.H.B.)	Melba 3rd of Darbalara (1058 M.S.H.B.)	Berry Farm ...	‖
" ...	Imperialist ... (183 M.S.H.B.)	Florio	Lady Nancy of Minembah.	Berry Farm ...	*
" ...	The Irishman (imp.)	Tipperary Bull	Colleen Bawn (imp.)	Robertson ...	17 Mar., '15
Jersey ...	Grenadin (imp.)	Attorney (9477)	Cyril's Carnation (imp.).	Yanco Farm ...	*
" ...	Trafalgar ...	Best Man ...	Rum Omelette	Cowra Farm ...	*
" ...	Kaid of Khartoum	Sir Jack ...	Egyptian Belle	H. A. College ...	*
" ...	Leda's Retford Pride.	Dinah's Lad ...	Leda's Angel..	Wagga Farm ...	‖
" ...	Goddington Noble XV (imp.)	Goddington Noble	La Franchise 3rd.	"	*
Guernsey ...	The King's Mirror	Calm Prince ...	Vivid (imp.)...	South Kyogle ...	15 Feb., '15.
" ...	Star Prince ...	Calm Prince ...	Vivid (imp.)...	Casino	23 April, '15.
" ...	Godolphin Moses (imp.)	Golden Hero of the Vauxbelets (1929)	Rosetta (6509)	Inverell	6 April, '15.
" ...	Hayes' Fido (imp.).	Hayes' Coronation 3rd.	Hayes' Fi-Fi 2nd.	Wollongbar Farm	‖
" ...	Claudius (imp.)	Golden Star II..	Claudia's Pride (imp.).	Murwillumbah ...	30 June, '15.
" ...	George III ...	King of the Roses	Calm 2nd ...	Wollongbar Farm	‖
" ...	The Peacemaker	Calm Prince ...	Rose Petersen	Wollongbar Farm	*
" ...	King of the Roses	Hayes' King ...	Rosey 8th (imp.).	South Kyogle ...	30 July, '15.
" ...	Lauderlad ...	Laura's Boy ...	Souvenir of Wollongbar	Mullumbimby ...	6 April, '15.
" ...	Belfast	King of the Roses	Flaxy 2nd ...	Tyalgum	28 May, '15.
" ...	Royal Preel ...	Itchen Royal ...	Hayes' Lily du Preel (imp.).	Tyalgum	30 Jan., '15.
" ...	Alexander the Great.	Claudius (imp.)	Alexandrina of Richmond.	Fredericton ...	25 Mar. '15.
Ayrshire ...	Dan of the Roses	Daniel of Auchenbrain (imp.).	Ripple Rose...	Grafton Farm ...	*
" ...	Wyllieland Bright Lad (imp.)	Wyllieland Gleniffer (7229)	Wyllieland Sangie	Glen Innes Farm..	*
" ...	Isabel's Majestic	Majestic of Oakbank.	Isabel of Gleneira.	Grafton Farm ...	‖
Kerry... ...	Castle Lough Ranger (imp.)	Waterville Rover	Castle Lough Lizzie.	Bathurst Farm ...	*

*Available for service only at the Farm where stationed. † Available for lease or for service at the Farm where stationed
‖ Available for special service where stationed upon application to the Under Secretary.

BULLS FOR SALE

AT THE ROYAL AGRICULTURAL SOCIETY'S SHOW, EASTER, 1915.

IRISH SHORTHORN.—Irish Boy (577): Passed for Vol. IV of M.S.H.B. Date of birth, 9th April, 1912; colour, rich roan; sire, Limerick's Lad (imp.); dam, Colleen Bawn (imp.).

Milk yield of dam :—	Milk lb.	Fat per cent.	Butter lb.
Colleen Bawn...	6,937	3·8	309

GUERNSEYS.—Mountain Prince (593): date of birth, 12th January, 1913; colour, lemon and white; sire, Calm Prince; dam, Angelica 8th (imp.).

Rohais' Lad (601): date of birth, 18th March, 1913; colour, lemon and white; sire, Calm Prince; dam, Rohais' Lassie (imp.).

Milk yield of dam :—	Milk lb.	Fat per cent.	Butter lb.
Rohais' Lassie	5,537	5·1	333

Othello (605): date of birth, 4th April, 1913; colour, lemon and white; sire, Trengwainton Village Favourite (imp.); dam, Desdemona 8th (imp.).

Milk yield of dam :—	Milk lb.	Fat per cent.	Butter lb.
Desdemona 8th (imp.)	6,721	4·3	340

Four-leaf Shamrock (584): date of birth, 26th November, 1912; colour, lemon and white; sire, Calm Prince; by Rose Prince (imp.); dam, Shamrock of Les Vesquesses (imp.) (5394), by Royal Blood 5th (1111).

	Milk lb.	Fat test per cent.	Butter lb.
Milk yield of dam	4,941	4·9	285

King of the Preel (592): date of birth, 31st November, 1912; colour, lemon and white; sire, Trengwainton Village Favourite (imp.) (2102); dam, Flower of the Preel 3rd (imp.) (209).

	Milk lb.	Fat test per cent.	Butter lb.
Milk yield of dam	6,137	4·6	332

HOLSTEINS.—Captain Muller (No. 609), calved 16th May, 1913; colour, black and white; sire, Powerful of Brundee, by Edinglassie (imp.); dam, Miss Muller, by Hollander, by Bosch 3rd (imp.); g d, Margosa, by Garfield (imp.); g g d, Maggie Obbe, by Obbe (imp.); g g g dam, Margaretha (imp.).

Milk yields :—	Milk lb.	Test per cent.	Butter lb.
Miss Muller (first calf)	7,262	3·4	288
Margosa	6,349	3·2	237
Maggie Obbe	7,699	—	272
Margaretha (imp.)	10,990	—	407

No. 625 (unnamed), calved 19th September, 1913; colour, black and white; sire, Cavalier, by De Wet, from Fraulien Arama; dam, Lolkje Amster, by Amsterdam; g dam, Lolkje, by Joubert, from Lolkje Veeman (imp.); Amsterdam was by Garfield (imp.), from Lady Margaret, by Obbe (imp.), from Schot 5th (imp.).

Milk yields :—	Milk lb.	Test per cent.	Butter lb.
Lolkje Amster (295 days) ...	6,012	—	259
Lolkje (first calf)	5,828	3 5	234
Lady Margaret (first calf) ...	6,000	—	277

GEORGE VALDER,
Under Secretary and Director of Agriculture.

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Agricultural Gazette of New South Wales.

The Butter Industry.

M. A. O'CALLAGHAN.

MUCH has been written and still more has been said during the last twelve months regarding the quality of Australian butter. It is a great pity that people who set about to investigate causes of alleged inferiority do not first analyse their own fitness to act as judges in such an important matter. It is true that judges presiding at law courts are frequently placed in a position which asks them to pass judgment on matters which are of a technical character, and in which they have had no special training, but before doing so they are in the happy position of having both sides of the question thoroughly thrashed out by able examiners and cross-examiners criticising expert witnesses who present all the pros and cons of the case in which they are interested.

Unfortunately for the opinions of many self-appointed judges on the dairying industry of Australia, they have not had the training to enable them to discriminate between what is correct and what is incorrect in the way of technical matter, and they do not appear to have produced evidence which would go to show that they have had carefully-prepared data on the various factors affecting the quality and sale of Australian butter.

We have had the extraordinary position in London of the Agents-General of three States agreeing to a combined action and report in London, while the Agent for the parent State of New South Wales, no doubt disagreeing with the lines of action proposed by the other Agents-General, has issued an independent report.

Then, again, commercial agents have given opinions formed as a result of previous experience in Australia and a trip to England. In addition, we have had a report from a board composed of three gentlemen who visited New Zealand, and further reports have been given by agents who visited the United States. A multiplicity of opinions has been put forward, while the principal co-operative agent in Victoria appears to differ fundamentally from the principal co-operative agent in New South Wales as to the means which should be adopted for improving the quality of Australian butter.

In all this variety of advice it is no wonder that the dairy farmer is somewhat bewildered, and that factory managers cannot agree to a common basis for overcoming the defects under which the industry is palpably labouring.

With a suitably organised committee, consisting, say, of a farmer who was also chairman of a butter factory, of a co-operative agent who had experience both in Australia and in England, and of a person expert in dairy matters and acquainted with Australian conditions, we might have been able to get

a report which would be very valuable and carry sufficient weight to influence those who are directing the destiny of the industry throughout Australia. As matters now stand, legislators of the country who take an interest in the matter have their minds disturbed by different recommendations for the betterment of things.

The Reason for the present Agitation.

There can be no gainsaying the fact that the chief reason for the present apparent alertness on behalf of those concerned is due to the improved position which margarine has made in the commerce of the world, owing to its improved quality. So long as the buttermaker had no serious competitor so long was there a monopoly, and hence, even though he produced a somewhat inferior article, he was, thanks to the growing population of the world, in a position to obtain a price therefor that made it profitable for him to remain in the industry.

The position facing him to-day is: How long is it before the manufacture of second-quality butter in large quantities will, owing to its low value, compel those producing it to abandon dairying?

The position facing the owners of land in dairying districts is: How much is the value of their lands going to be depreciated by the fact that inferior quality butter must take a place below that of best margarine in the eyes of the consumers of the world?

The position facing the butter factory manager is: If the manufacture of butter becomes less profitable what will be the standard salary for factory managers?

The position of the salesmen and merchants handling the product is: What will be the reduction in their annual incomes when the turnover in butter for export and for home trade has been seriously reduced?

The position facing those who are in any way interested in the welfare of Australia, and, more particularly, in the development of a "White Australia," is: What industry can take the place of dairy-farming, which will enable the land to carry the same population in a remunerative way, and thus provide bone and sinew for the development and advance of the country?

To use a common expression, it is seen that we are all "in the same boat." The butter industry in Australia is a national one, and whatever affects the welfare of that industry affects the welfare of the nation. Surely then the counsel of any self-appointed inquirers on margarine or on butter questions, especially when they vary in their opinions on basic principles, should not be allowed to have too much weight in an unprejudiced and dispassionate consideration of the defects and remedies of what at one time promised to be the best industry in Australia for the settlement in large numbers of the people on the land.

Although there are many minor points on which the quality of butter manufactured in Australia hinges, still those whose experience and training fit them to form a sound opinion, must, on mature consideration, come to but one conclusion, namely, that the cause of so much inferior butter being

made is primarily due to the basic fact, namely, *that the farmer has become a manufacturer.* Look at it how you will, it must be admitted that the farmer who keeps his cream even in summer for twenty-four hours at his farmhouse controls the situation, insomuch as he plays the part of manufacturer in the most vital stage of butter production, namely, the ripening of the cream.

All butter manufacturers must know and admit that the fermentation processes governing the ripening of the cream are the chief factors that determine the flavour of butter, and as cream during the summer months in Australia—or at least in New South Wales and Queensland—ripens sufficiently for churning in about fifteen hours unless controlled by a material and rapid cooling immediately after separation, the issue seems one of control of cream quality.

The question at this stage of our considerations might be asked: What percentage of the dairy-farmers who use private separators in Australia understand the proper ripening of cream?

The committee of three who visited New Zealand with a view to inquiring into the reasons why Australian butter is not uniformly as good as New Zealand gave as one of its chief reasons the fact that the great majority of New Zealand butter was manufactured from milk delivered daily at the factories where the ripening of cream is properly controlled. In drawing this conclusion, this committee undoubtedly touched the main cause of discrepancy in quality, but the committee did not suggest that the private separator should be abolished in Australia, nor, in my opinion, would there be any use in suggesting that we should revert to the method of delivering milk daily at factories, as was done prior to 1898. I will go further and say that it is not at all necessary to revert to that system in order to raise the standard of our butter to a satisfactory stage. In New South Wales we have advanced so far in the use of the private separator that there is no hardship in demanding the daily delivery of cream in all the principal dairying districts of the State, and it is certainly easier to deliver 10 gallons of cream daily than it would be to deliver 100 gallons of milk. While on this part of the subject, it may be worth quoting from an article written by me in the *Agricultural Gazette* for September, 1898:—

"The Private Separator.

"This system of dairying is fast gaining ground here also, especially in districts where separating stations are not numerous, and in new districts where dairying is not yet extensive enough to run separating stations. The system is not a good one from an exporter's point of view, as it interferes with the uniformity of the butter.

"Before the introduction of the separator, factory dairies were started in the south of Ireland, where each farmer brought his cream and in most cases had it churned separately. This system failed, and gave place to the separating stations, owing to the fact that a great portion of the cream was tainted more or less when it reached the factory, and hence a uniformly good butter was impossible.

"Hence, then, the private separator owner in this Colony is forced to send his cream to the central factory to be cooled and made into butter; and as he does not send the cream to the factory every day, it arrives in the same condition, only at a much higher temperature, as that instanced in the original cream factories in Ireland, and a butter uniform in quantity, and of high quality, is impossible.

"Needless to say, when the private separator owner takes proper care of his milk, cools his cream, and forwards it quite sweet to the factory, the manager can then pour all the creams into one vat—of course, rejecting or putting aside anything tainted—ripen them uniformly, and manufacture therefrom a high-class uniform butter.

"It is only under such conditions that a butter suitable for our export trade can ever be made from private separators, and it remains for the central factory-owners to work out the problem, and insist on all cream, whether from a private separator owner or a small or large separating station, being sent to their factory daily—at least during the summer months. The great evil lies not so much in the system itself as in the ruinous customs which most factories adopt of paying for all cream, tainted or untainted, under-ripe or over-ripe, a uniform price for every pound of butter-fat it contains."

The New Zealand Committee therefore said what was thus written in 1898.

The Outlook for Butter.

After many weary years of waiting, it looks as though pasteurisation may become general, not only in New South Wales, but in Australia.

In an article in the February *Agricultural Gazette* for 1898 I drew attention to the value of pasteurisation to the Australian butter-maker, and pointed out that as he lived further away from his markets than any of his competitors, it was necessary that he should make a better-keeping butter than they were doing, in order to place himself on equal terms with them on the British markets. This was followed up with repeated articles, lectures, and demonstrations, and as a result certain factories adopted the system. The Berry central factory, in particular, made a great effort to show the value of pasteurisation, and for some time they obtained a half-penny per lb. for pasteurised butter more than the top market rates in Sydney. The cream from the branch factories or separating stations was sent to the Berry central factory, pasteurised, and made into butter, which obtained an excellent reputation both on the Sydney and on the British markets.

Those in charge of the co-operative movement at the time, however, could see no benefits in pasteurisation, and this fact, together with the progress of the private separator and the delivery at central factories of stale cream, prevented the movement from becoming general.

The Fresh Food and Ice Company at Grafton, and the New South Wales Creamery Company (then managed by Mr. C. C. Lance), generally adopted pasteurisation in their factories, and to this day the Alstonville factory,

which was at that time a branch of the New South Wales Creamery Company, has practically without ceasing continued to pasteurise its milk or cream.

The Department of Agriculture further assisted the cause of pasteurisation by supplying lactic ferment free for the making of starters, and this it has continued ever since.

The representatives of the co-operative bodies who visited New Zealand last year did a good turn to the industry when they so strongly recommended pasteurisation in their report. Had a similar committee visited Europe in 1898, when I was so strongly advocating pasteurisation here, there is no doubt but that their report on this head would have been similar to the report brought forward by the committee that visited New Zealand. There is, however, no use in lamenting lost opportunities; we must face the issue of the moment; and, thanks to the pressure which is being brought by margarine manufacturers, it will be necessary in the future either to manufacture a first-class dairy product or abandon butter-making. A year ago those in the van of the industry were worrying themselves considerably over the evidently bad position of the butter industry, owing to the remarkable improvement in the quality of margarine and to the consequent increased manufacture thereof. To-day, thanks to almost famine prices on the British markets for butter, as a result of the great European war, we do not hear very much about the questions so repeatedly discussed last year. Owing to scarcity, second-quality butter finds a ready sale at a good price, and for the moment the farmer is resting in what he thinks is a return to a secure position.

When the war ends, however, I think it will be found that margarine will have captured a great section of the community who were previously eaters of pure butter. Margarine was introduced to mankind as a result of war; and as a consequence of the present strenuous fight between nations the price of butter in England has during the season been so extremely high, coupled with trade depression, that the number of people who cannot afford to purchase pure butter must have grown tremendously during the last six months; hence, not only in England, but throughout Europe, generally speaking, margarine will have made rapid advances in public favour, and people who were compelled, by reason of extreme prices and bad times, to begin the use of margarine, will continue it as a result of favourable experience; because there is no gainsaying the fact that the best margarine of to-day is a very palatable and satisfying substitute for butter. The fact that it is not so valuable to the young, nor so nutritious as butter will not affect the general public view. Under these circumstances it is rather difficult to see what opening will exist for the disposal of inferior butter, except at rates so low that it will be in a position to favourably compete with margarine.

There is only one factor which may help butter-makers for some time after the war ends, and this is the tremendous wastage which must be taking place in the dairy herds of Europe. Meat has become such an

expensive item that it is only reasonable to assume that the dairy herds of Great Britain and Europe will be very considerably reduced owing to the sale of dairy cows and heifers for beef purposes.

Farmers in New South Wales and elsewhere have become seized with the possibility of the butter industry being made an unpayable one by competition with margarine, and to-day a great many are turning their thoughts towards cheese making as a safer industry in which to have their capital invested. The cheese industry, however, can be very easily overdone, as the world has never shown any tendency to develop an increased capacity for the consumption of cheese in the same way that it has shown a desire to consume more butter, according as the quality improved, and the price became reasonable. New Zealand has practically supplied the deficiency in Canadian cheese exports to England, and as New Zealand has greater facilities for the manufacture of a high-class cheese than we have in New South Wales, generally speaking, it goes without saying that New Zealand is more likely to supply any further deficiency which will take place in the supply of cheese to British markets. Hence, then, it behoves everybody interested in the butter industry of Australia to make an effort to reduce the percentage of inferior butter which is manufactured and which is placed on British markets.

The report of the Agent-General for New South Wales went to show that, as far as British opinion was concerned, not more than 40 per cent. of the butter imported into England from Australia during 1913 would reach the standard of first-quality. The statistics obtained under the Commerce Act regarding butter exported from New South Wales went to show that 51 per cent. of the graded butter was first-class; but, as only 58 per cent. of our butter was graded for the year ended 30th June, 1914, we must, I am afraid, assume that there was a higher percentage of second-quality in the ungraded than there was in the graded butter. If we admit that even 50 per cent. of the butter exported from Australia is of a quality below first-class, we must acknowledge that our position is very insecure, and that, unless we can show a rapid improvement, our position may become untenable when judged on economic standards.

A glance at the records of last Sydney Royal Show will readily indicate that there is some great defect in the manufacture of our butter. In the continuous butter competition, wherein samples of the butter representing the competing factories are examined once a month for seven months, it was shown by the judging that out of the 175 lots of butter examined, 113 lots failed to reach the standard for first quality, which is 90 points. Thus, 64 per cent. of the competing butters were of a quality below first-class. To what is due this extremely high percentage of inferior butter? The answer is easily found. It is due to the fact that the cream selected for the manufacture of this butter had suffered from injurious fermentations before churning, and consequently the butter manufactured was of a poor keeping quality. An analysis of the keeping-butter class at the same show revealed an even worse state of affairs.

I have recently visited the exporting centres of the other States, and have formed the opinion that the quality of New South Wales butter is quite as good, on the average, as that of either Victoria or Queensland; though the latter State has made considerable improvement during recent years. The probability is that the average quality of our butter is somewhat better than that which was exhibited at the Sydney Show referred to above, and this year's statistics show that, owing to an excellent season, there is an improvement over the previous year in quality. But, nevertheless, the percentage of inferior butter made during the twelve months is an extremely high one.

The agricultural labourer will not accept low wages merely because we inform him that the butter we manufacture is only second quality; neither will the land-owner accept this excuse as a plea for a reduction in rent.

The Remedy.

Mr. H. W. Osborne, manager of the Western District Factories' Co-operative Produce Company of Victoria, after what appeared to be a careful inquiry into the butter business both in England and Australia, made the following suggestions for the improvement of Australian butter:—

Section A.

That the Commonwealth Government—

(1) Empower the High Commissioner to employ skilled experts to examine and report on butter on its arrival in England.

(2) Pass regulations to provide (*a*) That all butter for export be examined at port of shipment by experts and their reports be furnished promptly to manufacturers. (*b*) That a Commonwealth guarantee of purity and weight be impressed on butter of the required standard. (*c*) That the date marks, stating month of production, be placed in each box of butter. (*d*) That butter below a certain standard be packed in plain boxes with only the words "Butter, 56 lb. net," branded on each box.

(3) That the graders in the several States meet at least twice annually for schools of instruction and conferences, in order to secure uniform grading.

(4) That investigations be made to discover the cause of "fishiness" in butter.

Section B.

That the State Governments—

(1) Adopt a uniform system of instruction and supervision over the sources of production and manufacture from the dairy farm to the factories and creameries, on lines similar to those of New Zealand.

(2) Adopt compulsory cream grading in all States.

(3) Establish educational institutions for instructors and those engaged in the manufacture of butter.

(4) Consider the advisability of arranging (by subsidising steamship companies or otherwise) for regular direct steamer service to Bristol and Hull.

That conferences of Ministers, Government officials, and representatives of producers' organisations be held, to consider the present unsatisfactory reputation of Australian butter and to suggest the best means of bringing about an improvement in quality.

Section A.

The following comments may be made:—

Suggestion No. 1—Some of the States now employ their own experts to send them reports from England on consignments of butter according as they arrive; but it would unquestionably be better if the Commonwealth had a high-class expert to report generally, as indicated by Mr. Osborne.

Suggestion No. 2—All the recommendations contained therein are good ones, but as Commonwealth law at the present time does not compel the grading of all butter, it is not possible to comply with all the recommendations referred to.

Suggestion No. 3—The Commonwealth has taken steps to bring all butter graders up to a uniform standard, and to have instruction imparted to them on uniform lines.

Suggestion No. 4—It is hardly necessary to make further investigations into the cause of "fishiness" in butter, as it can be clearly shown that fishiness is due to the activity of injurious germ life, either in the cream before churning, or in the butter during storage. Prevention and remedy will be dealt with later.

Section B.

Suggestions No. 1 and 2—Both of these are excellent recommendations, and No. 1 is carried out in this State to the extent which is possible according to present law; and with regard to No. 2, the New South Wales Government has introduced a bill into Parliament for the purpose of compelling the grading of cream.

Suggestion No. 3—New South Wales has already established educational institutions for teaching instructors, and, in addition, schools of instruction have been held annually at central butter factories, where scientific instruction of a practical nature is given in all details, and more especially in the grading of cream.

Suggestion No. 4—This is a matter for the consideration of the merchants and others concerned in the industry, and one which need not be dwelt upon here.

With regard to the last paragraph, it might be pointed out that the Minister for Agriculture and the Government officials in the various States hold annual conferences, and at the last conference, which was held in Brisbane, uniform action was decided on in connection with steps calculated to improve the dairying industry, but until legislation can be brought into effect it will be impossible to bring about many of the recommendations of that conference; more especially that in connection with the

compulsory grading of cream. In addition to the recommendations of Mr. Osborne, other steps are necessary before we can reach the standard of efficiency which is not only desirable, but which has become a practical necessity.

The first of these is that all milk and cream testers shall, practically speaking, be licensed testers, and shall lose their certificate or license to practice if it is found that they are not recording the true tests of the cream or milk.

The next, and most important, step is that all the butter manufactured from the farmers' cream should be paid for, and therefore the means whereby a fund enabling top prices to be paid for inferior cream would be eliminated.

The next, and not the least important, step required in order to put the industry on a satisfactory basis is the general pasteurisation of all the milk or cream utilised for the manufacture of butter for export. This brings us to a consideration of the question of pasteurisation of sour cream.

Pasteurisation of Sour Cream.

Had pasteurisation received the support of those most intimately concerned we would have had a better delivery of cream at central factories during the last ten years. The fact that it would have been necessary to deliver the cream before it had become very acid, in order to enable it to be efficiently pasteurised, would have compelled better transit and more frequent delivery.

Everybody knows that if milk that is slightly sour is heated, the result will be curds and whey. The same applies to cream, the only difference being that, owing to the smaller quantities of curd and moisture present in the cream, the result is not so evident. For this, as well as for other technical reasons, the pasteurisation of sour cream is not satisfactory.

Some years ago, when holding a dairy science school at Bega, I demonstrated—what had been known to all dairy experts of any note—that, provided a certain percentage of the acidity in the cream was neutralised, the pasteurisation of the cream could be carried out with a certain amount of success. In a recent book* the following occurs:—"I have, however, pasteurised sour cream after neutralising the acid, afterwards ripening the cream with a good starter, and have thus worked much improvement; but, while this is possible in small experimental lots, it would not be easily practicable in ordinary factory routine."

Since that time, however, the neutralising of sour cream, with a view to the pasteurising of same, has become very common in New Zealand; and some factories in New South Wales and some in Victoria are also neutralising and pasteurising their cream supplies.

During the past year I have demonstrated in several factories in New South Wales the success which attends the pasteurisation of acid cream which has been previously neutralised, to show only about 0·2 per cent. of

* Dairying in Australasia. M. A. O'Callaghan. Page 546.

lactic acid. Certain experiments have also been conducted in the use of carbonate of lime and bi-carbonate of soda as neutralising agents.

With cream of a fair class, the results favoured the use of carbonate of lime; but, owing to the insolubility of this substance, neutralisation by its aid becomes tedious, and if carried out on a large scale it would be necessary to have a rotatory or other stirring movement going on in the cream-receiving vat; otherwise the neutralising would not be uniformly done.

Sodium bi-carbonate, however, is extremely soluble, and fills the requirements as far as a neutralising agent is concerned. It also has the advantage over carbonate of lime of providing for a greater amount of aëration through the formation of gas, and thus helping towards getting rid of a certain amount of noxious gases that are found locked up in ripe cream. When the soda is added to the cream the latter, of course, has a strong foreign taste; but as the soda, which is now present in the form of lactate of soda, is all washed away in the butter-milk and washing water of the butter, there is, practically speaking, no soda flavour in the resulting butter, though it is possible to detect a very slight flavour of this kind when the butter is freshly made. This is probably due to the fat globules having absorbed the odour of the soda from the serum in which the globules were floating. In cold storage this faint soda flavour disappears, and, if the pasteurising has been well done, provided the cream was of fair quality, a really high-class keeping butter may be produced. There is no secret whatever in this process, and any person who has had experience in pasteurisation cannot possibly make a mistake if they follow the ordinary formula for neutralising the acidity. The method of procedure is as follows:—

Two cream receiving-vats are required, as one vat cannot be used to receive and discharge at the same time. When the cream receiving-vat is full the acidity of the mixed cream is taken, and, supposing this shows 0·5 per cent. acidity, the next step is to reduce that acidity to, say, 0·2 per cent. This means eliminating 0·3 of a lb. of acidity from every 100 lb. of cream; and to do this we employ 0·3 lb. of sodium bi-carbonate. This formula is not chemically exact, but it is sufficiently approximate for all practical purposes, as it does not matter whether we reduce the acidity to ·22 per cent. or ·18 per cent., but I think that, except in extreme cases, it is inadvisable to reduce the acidity much below 0·2 per cent. Under no circumstances should the acidity be entirely neutralised, as the alkaline condition will injuriously affect the albumen in the cream.

A number of keeping tests in connection with butters, made during the dairy science school at the Albion Park central factory, revealed the fact that the butter made from cream that had been neutralised and pasteurised turned out very much better than the ordinary butter of the factory at the end of a period of four weeks and of eight weeks. Details of these experiments will be given in next issue.

(To be continued.)

Wheat and Oats for Hay under Irrigation at Yanco.

In order to gather some idea of the yield of several varieties of wheat and oats when grown for hay under irrigation, plots were sown at the Yanco Experiment Farm of most of the varieties likely to do well under such conditions, together with a few unnamed varieties at present in the hands of the Plant Breeder.

The seed was sown by hand at the rate of 20 lb. per acre, and superphosphate was applied at the rate of 60 lb. per acre. The drills were 10 inches apart.

The land previous to sowing was well worked and irrigated. The different plots each consisted of four rows, with a space of 2 feet 6 inches between the plots. For the first two irrigations this space was furrowed, and the water allowed to percolate through the plants, thus preventing the land to a large extent from setting hard. The last irrigation was applied by flooding. The furrows in each instance were cultivated after irrigating.

The seed, with few exceptions, germinated well; Commonwealth did not give above a 40 per cent. germination, and Cleveland might also have been better.

The sowing was carried out from the 25th May to 30th May, which was rather late for some of the varieties, and must have had an effect on the yields.

The following rainfall was recorded during the growth:—

June...	43 points.
July...	14 „
August	7 „
September	9 „
October	Nil.
Total	73 points.

The irrigating was carried out on 14th August, 4th September, and 9th October, only the later maturing varieties being watered the last time.

The yields, computed on an acreage basis, were as follow:—

WHEAT.

Variety.	No. of Irrigations.	Date of Harvesting. 1914.	tons	c.	q.	lb.
Canberra	2	6 October.	2	7	3	13
No. 2 (Wagga)	2	6 „	2	19	3	9
No. 3 „	2	6 „	3	11	3	6
No. 4 „	2	6 „	2	7	3	13
No. 5 „	2	13 „	2	7	3	13
No. 8 „	2	13 „	2	19	3	9

WHEAT—*continued.*

Variety.	No. of Irrigations.	Date of Harvesting. 1914.	tons	c.	q.	lb.
Bunyip	2	13 October.	2	1	3	14
Firbank	2	6 ,,	2	19	3	9
Florence	2	6 ,,	2	13	3	11
Comeback	2	13 ,,	2	19	3	9
Nardoo	3	19 ,,	3	11	3	6
Warren	2	13 ,,	3	5	3	8
Thew	2	13 ,,	1	15	3	17
Federation	3	19 ,,	2	13	3	11
Bomen	3	19 ,,	2	7	3	13
John Brown	3	30 ,,	2	9	1	2
Currawa	3	30 ,,	2	6	1	13
Commonwealth ...	3	30 ,,	1	9	3	18
Rymer	3	30 ,,	2	13	3	11
Yandilla King ...	3	30 ,,	2	13	3	11
Marshall's No. 3 ...	3	30 ,,	1	17	1	16
Zealand	3	19 ,,	3	11	3	6
Cleveland	3	30 ,,	2	0	1	15
A. Cowra X	3	30 ,,	2	16	3	10
B. Cowra X	3	30 ,,	2	9	1	12
C. Cowra X	3	30 ,,	2	12	1	11
D. Cowra X	3	30 ,,	2	9	1	2
E. Cowra X	3	30 ,,	1	18	3	15

OATS.

Ruakura	3	30 October.	2	7	3	13
Red Rust Proof ...	3	30 ,,	2	10	3	12
White Tartarian ...	3	16 November.	2	7	3	13
Bathurst Early ...	3	30 October.	2	10	3	12
Guyra	3	30 ,,	2	16	3	10
Sunrise	3	23 ,,	2	13	3	11
Leader	3	16 November.	2	7	3	13
Algerian	3	30 October.	1	15	3	17

JERUSALEM ARTICHOKE PLANTS AS ENSILAGE.

A CORRESPONDENT recently asked whether the growth of Jerusalem artichokes above ground would make satisfactory silage, and if so, at what stage it should be cut. The stalks of the artichokes were, at the time of writing, full in flower, and from 10 to 15 feet high. The correspondent also mentioned that he was making sorghum ensilage.

In reply, the Chief Inspector of Agriculture stated that the top growth of Jerusalem artichokes would not make satisfactory silage, and he would not advise attempting to make silage of them alone. But if the writer was making sorghum silage and was particularly short of feed, he could utilise the artichokes in the proportion of 1 part of the stalks to 3 parts of sorghum. The earlier the artichoke stalks are cut for silage the better. The nutritive value of the top growth of artichokes is, however, very low.

Potato Experiments, 1914.

GRAFTON EXPERIMENT FARM.

H. WENHOLZ, B.Sc. Agric., Acting Experimentalist.

The Experiments Supervision Committee, under whose control these experiments are being conducted, wish to draw the attention of farmers to the fact that final conclusions cannot yet be drawn from these trials, as they have only been conducted for a few years. Later, when results for, say, five years are available, a summary will be prepared, as sufficient evidence should then be available to enable conclusions to be formed. Meanwhile it is felt that the public are entitled to know the results obtained each year.

The Season.

THE potato season this year on the Clarence was slightly better than the average. Though the first six or eight weeks after planting were particularly dry, the following months were very good, October being especially so. The soil was thus softened to a considerable depth and the tubers filled out well, some of Manhattan variety measuring 7 inches in their longest diameter, while some of Satisfaction were little inferior in size. The season was also one of the coolest for some years, practically no high temperatures being recorded before harvesting. Destructive insects were practically absent, and although Irish blight made its appearance amongst the earliest shipments from the district, the later crops were scarcely affected.

The rainfall during growth was as follows:—

August	74 points.
September	80 "
October	658 "
November	232 "
Total	10·44 inches.

EXPERIMENT No. I.—VARIETY TRIAL.

Object.

To ascertain the most suitable varieties of potatoes, from a commercial point of view, to grow in the Clarence River district.

The Soil and its History.

The soil on which the experiment was conducted was a dark, somewhat clayey alluvial, on the flat adjoining Alumy Creek.

A rotation of late maize and spring potatoes has been grown on this land for the past two years, previous to which it had been laid down to lucerne, and before which again it had been under cultivation for some years.

Size and Arrangement of Plots.

Each plot consisted of two rows, 4 links apart and 5 chains long, so that the area of each plot was ·4 square chain, or equal to one twenty-fifth of an acre; each plot was separated from the adjacent one by the same distance

between the rows. Every third plot was planted with the same variety (Satisfaction) as a check for comparing yields and estimating percentage yields, so that the variety giving the highest percentage yield in the table is the best yielding variety. Buffer plots of the same size were also sown with Satisfaction.

Preparation of the Ground.

After harvesting the maize and chopping down the stalks, the ground was ploughed 6 inches deep with a double disc, and allowed to lie in this state for a few weeks. It was then rolled and harrowed twice prior to planting, when it was in a loose friable condition.

The Seed.

The seed was obtained from various sources and was mostly well sprouted at the time of planting. The sets of all the varieties were cut down to uniform size, and usually two or more eyes were left on each set. The sets were cut just previous to planting and sprinkled with air-slaked lime. About 8 cwt. seed per acre was used.

Planting and Germination.

The land was furrowed out with a single-furrow mould-board plough, and the sets were planted by hand in every third furrow at a depth of 5 inches, and 15 inches apart in the row; they were planted on the side of the furrow and covered immediately with the plough. Planting took place on 14th August.

The germination was fairly uniform throughout.

After-treatment.

Before the shoots appeared the ground was cross cultivated with the disc-cultivator, the discs being set almost vertical. During growth three cultivations were given with the Planet Jr. implement, and with the last two cultivations the plants were hilled with hilling-sweeps attached.

Maturity.

The varieties tested may be grouped into the following classes as regards maturity:—

Early Varieties.—Early Rose, Early Vermont, Bliss's Triumph.

Mid-season Varieties.—Satisfaction, Up-to-date, Adirondack, Manhattan.

Late Varieties.—Brownell's Beauty, Rector, Surprise, Queen of the Valley, Coronation.

Notes on the Growth.

Satisfaction did not produce very vigorous tops, and was, moreover, slightly affected with blight, though the size and condition of the tubers left little to be desired. This variety has now been repeatedly beaten in yield by other varieties, and it is rather a pity it cannot be recommended for growing, as the quality of the tubers is excellent. Coronation, as usual, produced very vigorous and healthy tops, but although it again yielded best, it is objectionable on account of the large quantity of second growth on the tubers, which raises the cost of production by reason of the close grading

required. Surprise, Brownell's Beauty, and Manhattan grew healthy, vigorous tops, and the size and quality of the tubers were very satisfactory—those of Manhattan being again very large and uniform.

Harvesting.

The experiment was harvested on 10th December, though the haulms were still fairly green, owing to the cool season. The potato moth was not observed until towards the end of harvesting, when the weather was becoming much warmer, but by grading in the field and marketing straight away, the moth was not afforded much chance to do any damage. The harvesting was done by ploughing out with a single-furrow mould-board plough.

Yields.

Taking the yields of the several check plots of Satisfaction as 100, and calculating the yields of the other varieties, the percentage results of the different varieties are as follows:—

Coronation	150·3
Surprise	133·4
Brownell's Beauty	131·6
Manhattan	123·6
Satisfaction	100·0
Bliss's Triumph	94·8
Adirondack	94·7
Queen of the Valley	93·3
Rector	86·1
Early Rose	82·4
Early Vermont	71·7
Up-to date	52·3

TABLE I.—Showing Results of Experiment No. 1.

POTATO VARIETY TRIAL.

Area of Plots, one twenty-fifth of an acre.

Plot No.	Variety.	Yield per Plot.	Yield per Acre.				Percentage Yield.
		lb.	t.	c.	q.	lb.	
1	Rector	235	2	12	1	23	
2 (*check*)	Satisfaction	273	3	0	3	21	100·0
3	Queen of the Valley	291	3	4	3	23	93·3
4	Brownell's Beauty...	461	5	2	3	17	131·6
5 (*check*)	Satisfaction	389	4	6	3	9	100·0
6	Early Rose	334	3	14	2	6	82·4
7	Bliss's Triumph	399	4	9	0	7	94·8
8 (*check*)	Satisfaction	438	4	17	3	2	100·0
9	Manhattan	577	6	8	3	5	123·6
10	Adirondack	470	5	4	3	18	94·7
11 (*check*)	Satisfaction	525	5	17	0	21	100·0
12	Early Vermont	383	4	5	1	27	71·7
13	Up-to-date	284	3	3	1	16	52·3
14 (*check*)	Satisfaction	553	6	3	1	21	100·0
15	Coronation	777	8	13	1	21	150·3
16	Surprise	643	7	3	2	3	133·4
17 (*check*)	Satisfaction	447	4	19	3	3	100·0

Comments.

It will be seen that Manhattan has maintained the promise it showed last year of being better than Satisfaction for the Clarence River. Being an early maturing variety, it may be grown either as an early or a late crop. Coronation gives the best yield, but, as mentioned before, it is objectionable for the coast on account of the large amount of second growth it produces. Surprise and Brownell's Beauty have both beaten Manhattan in the matter of yield, but are out of place where an early crop is required, as is the case on the Clarence. The average yield of Manhattan in all experiments in the season just past was about 6 tons per acre, and the prices obtained for the consignments in Sydney ranged from £8 to £12 per ton. The results of the previous season (1913), which was a poor one for potatoes, showed that Manhattan out-yielded Satisfaction by nearly 100 per cent., and it seems high time that the latter was discarded wholly in favour of the former for the Clarence District.

EXPERIMENT No. II.—DEPTH OF PLANTING.

Object.

To determine the effect on yield of planting sets at different depths.

The Plots and their Arrangement.

Soil and rotation, preparations for planting, treatment of seed, manner and time of sowing, and after cultivation, were all the same as in the foregoing experiment.

Satisfaction was the variety used throughout this experiment.

The plots were of similar size to those in Experiment No. 1, viz., one twenty-fifth of an acre. Every third plot was a check plot with sets sown 5 inches deep, and the other depths tested ranged from 3 inches to 7 inches.

Seed and Planting.

Eight hundredweight of well-sprouted seed was used per acre.

The sets were dropped by hand behind the plough, 15 inches apart in the row, and were covered immediately; the different depths were obtained by raising or lowering the wheel standard of the plough.

Growth.

No apparent difference was noticed in the vigour or healthiness of the tops. All the plots had a quite similar appearance, notwithstanding the variation in the depth of planting.

Results.

The percentage yields in order of merit are as follows:—

Sets planted	4	inches deep	111·8
,,	3	,,	108·8
,,	6	,,	108·8
,,	5	,,	100·0
,,	7	,,	97·6

TABLE II.—Showing Results of Experiment No. II.

DEPTH OF PLANTING TRIAL.

Area of plots, one twenty-fifth of an acre. Variety, Satisfaction.

Plot No.	Method of Planting.	Yield per Plot.	Yield per Acre.				Percentage Yield
		lb.	t.	c.	q.	lb.	
1 (*check*) ...	Sets 5 inches deep	511	5	14	0	7	100·0
2	„ 3 „	553	6	3	1	21	108·8
3	„ 4 „	566	6	6	1	10	111·8
4 (*check*) ...	„ 5 „	504	5	12	2	0	100·0
5	„ 6 „	544	6	1	1	20	108·8
6	„ 7 „	484	5	8	0	4	97·6
7 (*check*) ...	„ 5 „	492	5	9	3	8	100·0

Average yield per acre—5 tons 16 cwt. 2 qrs. 2 lb.

Comments.

From the results obtained it does not appear that any definite conclusion can be drawn as to the best depth to plant. The yields are so close and so conflicting that it cannot be said whether a shallow, medium, or deep planting is best. It is believed, though, that for this district the tubers should not come too near the surface or they should be well hilled, so that they may not be exposed to the potato moth near harvesting time. Whatever may be the results obtained in a drier season, the depth of planting had very little effect on the yield this year.

EXPERIMENT No. III.—SIZE OF "SET" TRIAL.

Object.

To ascertain from the yield the most economical size of set to use in planting.

The Surrounding Conditions.

Soil and rotation, preparation for planting, after treatment, manner and time of sowing as in previous experiments.

Manhattan was the variety used throughout this experiment.

The Seed.

The seed tubers were graded as follow:—

1. Large tubers, *i.e.*, those upwards of 2 inches in diameter.
2. Small tubers, *i.e.*, those below 1¼ inches in diameter.
3. Medium tubers, *i.e.*, those between 1¼ and 2 inches in diameter.

The approximate quantity of seed sown per acre was as follows:—

Large (whole) 28 cwt.	Medium (whole) 18 cwt.	Small (whole) 8 cwt.
„ (cut once) 14 cwt.	„ (cut once) 9 cwt.	„ (cut once) 4 cwt.
	„ (in quarters) 4½ cwt.	

Planting.

The different sized sets were dropped by hand in their respective plots behind the plough, 15 inches apart and 5 inches deep in the furrow.

Size and Arrangement of Plots.

Each plot consisted of two rows, 4 links apart, and with 4 links between it and the next row. The length of each plot was 417 links, so that the area harvested was one-thirtieth of an acre in each case. Every third plot was a check plot planted with medium sized tubers cut in quarters.

Notes on Growth.

Plots 2 and 3, containing large and medium sized whole tubers respectively, were apparently the most vigorous, judging by the tops. More branching took place in these plots, and the rows met sooner and covered the ground, protecting it from evaporation.

Results.

The net percentage yields are given in order as follow :—

Size of Set.	Seed per Acre.	Percentage.
Large, cut once	14 cwt.	117·1
Medium, cut once	9 "	111·0
Large, whole	28 "	107·7
Small, whole	8 "	105·8
Medium, whole	18 "	101·4
" in quarters ...	$4\frac{1}{2}$ "	100·0
Small, cut once	4 "	99·4

TABLE III.—Showing Results of Experiment No. III.

SIZE OF "SET" TRIAL.

Area of plots, one thirtieth of an acre. Variety, Manhattan.

Plot No.	Size of Set.	Yield per Plot, net.*	Yield per Acre, net *				Percentage Yield.
		lb.	t.	c.	q.	lb.	
1 (*check*) ...	Medium, cut in quarters	396	5	6	0	8	100·0
2	Large, whole	414	5	10	3	16	107·7
3	Medium, whole	378	5	1	1	0	101·4
4 (*check*) ...	" cut in quarters	361	4	16	2	22	100·0
5	Small, whole	375	5	0	1	22	105·8
6	Large, in halves	407	5	9	2	0	117·1
7 (*check*) ..	Medium, cut in quarters	341	4	11	1	10	100·0
8	" cut in halves	383	5	2	2	10	111·0
9	Small, cut in halves	347	4	12	3	22	99·4
10 (*check*) ...	Medium, cut in quarters	353	4	14	2	6	100·0

* The net yield is the amount harvested less the amount sown.

Comments.

It is well known that a fairly close relation exists between the weight of the set and the yield of the plant, those plants usually producing the greatest weight of tubers that have gone from the largest set. This fact is again borne out in this experiment, but the object is to determine which is the most economical method of planting. From the results obtained here there does not seem to be much difference between the yields when the net results are taken. It will be noted that a medium rate of planting (14 cwt. of large tubers cut once) gives slightly better results than any other.

EXPERIMENT No. IV.—POTATO MANURIAL TRIAL.

Object.

To determine the effect on the yield of potatoes of the direct application of different mixtures of fertilisers with the seed to alluvial soil in the Clarence River district.

The Surrounding Conditions.

The soil, previous cropping, preparation for planting, after cultivation, &c., were similar to those in previous experiments.

The variety used throughout was Manhattan.

Size and Arrangement of Plots.

Each plot consisted of four rows, each 4 links apart and 312½ links long, so that the area of each plot was exactly one-twentieth of an acre. Every third plot was unmanured, so that the percentage yields of the plots manured with the different fertilisers could be obtained, and experimental errors due to soil differences obviated as far as possible.

The Seed and Planting.

The seed was cut to a uniform size, so that no plot had an advantage over another because of large seed.

Planting took place on 11th August, in furrows 5 inches deep.

Application of Fertiliser.

The fertilisers were scattered by hand along the furrow prior to planting.

The following table shows the amount of manurial ingredients supplied by the different fertilisers:—

Superphosphate	17 per cent. phosphoric acid.
Sulphate of Potash ...	52 „ potash.
Sulphate of Ammonia ...	20 „ nitrogen.
Bone-dust	22 „ phosphoric acid, 3·5 per cent. nitrogen.
Dried Blood	13·5 per cent. nitrogen.
Fish Manure	8 „ nitrogen, 8 per cent. phosphoric acid.

Notes on Growth.

Plots 11, 12, and 15 appeared the most vigorous during growth, and it will be seen that each of these plots had an organic nitrogenous manure. In a good season most of this would become available, and this was apparently the reason for the success of the plots with organic manures in this trial.

Results.

The percentage yields in order of merit are as follow :—

Plot No. 12	(dried blood, superphosphate, sulphate of potash) ...	146·4
„ „ 11	(bone-dust, superphosphate, sulphate of potash)	144·4
„ „ 8	(sulphate of ammonia, superphosphate, sulphate of potash)...	124·5
„ „ 5	(superphosphate, sulphate of potash)...	120·0
„ „ 9	(superphosphate, sulphate of potash)...	112·6
„ „ 6	(superphosphate, sulphate of ammonia) ...	111·6
„ „ 15	(fish manure, sulphate of potash) ...	107·3
	Unmanured check plots ...	100·0
„ „ 2	(superphosphate) ...	90·4
„ „ 14	(superphosphate, sulphate of ammonia, sulphate of potash)...	79·3
„ „ 3	(sulphate of potash) ...	74·4

TABLE IV.—Showing results of Experiment No. IV.

MANURIAL TRIAL.

Area of plots, one-twentieth of an acre. Variety, Manhattan.

Plot No.	Manure.	Manure per acre.	Yield per plot.	Yield per acre.				Percentage Yield.
		lb.	lb.	t.	c.	q.	lb.	
1 (*check*) ...	No manure ...	...	629	5	12	1	8	100·0
2 ...	Superphosphate ...	291	567	5	1	1	0	90·4
3 ...	Sulphate of potash ...	67	465	4	3	0	4	74·4
4 (*check*) ...	No manure ...	...	623	5	11	1	0	100·0
5 ...	Superphosphate ... Sulphate of potash ...	291 67	737	6	11	2	12	120·0
6 ...	Sulphate of ammonia ... Superphosphate ...	90 291	676	6	0	2	24	111·6
7 (*check*) ...	No manure ...	...	598	5	6	3	4	100·0
8 ...	Sulphate of ammonia ... Superphosphate ... Sulphate of potash ...	90 291 67	717	6	8	0	4	124·5
9 ...	Superphosphate ... Sulphate of potash ...	291 112	625	5	11	2	12	112·6
10 (*check*) ...	No manure ...	...	534	4	15	1	12	100·0
11 ...	Bone-dust ... Superphosphate ... Sulphate of potash ...	219 73 112	754	6	14	2	16	144·4
12 ...	Dried blood ... Superphosphate ... Sulphate of potash ...	186 180 80	745	6	13	0	4	146·4
13 (*check*) ...	No manure ...	...	496	4	8	2	8	100·0
14 ...	Sulphate of ammonia ... Superphosphate ... Sulphate of potash ...	120 180 80	375	3	6	3	24	79·3
15 ...	Fish manure ... Sulphate of potash ...	420 80	484	4	6	1	20	107·3
16 (*check*) ...	No manure ...	...	429	3	16	2	12	100·0

Comments.

Characteristic of this trial is the pronounced success of organic manures like dried blood and bone-dust. It is naturally expected that the benefit of such manures would show out in a good season. It is thought that these are much more suitable manures than the chemical, quick-acting fertilisers, which, in a wet climate such as the North Coast, are liable to be rapidly leached from the soil out of reach of the plant roots. On the other hand, the organic manures (especially those supplying nitrogen) become available in much smaller quantities at a time, but are not as slow acting as is commonly supposed, especially in the moist, warm climate of the North Coast.

Fish manure is worth another trial, as the plot on which it was applied (No. 15), and also the adjoining one (No. 14), covered a strip of shallow, clayey ground, where there had evidently been a wash at the time of the formation of the alluvial soil. The loss in yield due to this is not sufficiently compensated by the check plots, and the percentage yields are still abnormallv low.

To Make Tapioca from Cassava Roots.

The North Coast Agricultural Societies' Association asked the Department lately how a small quantity of cassava roots should be treated to produce tapioca.

Mr. W. M. Carne, of the Botanic Gardens staff, advised that for the extraction of the starch the roots should first be scraped, or peeled if necessary, and then ground upon a large scraper into a fine pulp. This should be put into a very fine sieve, the bottom of which is suspended beneath the surface of a tub of water. From time to time the pulp should be kneaded, to work out the starch, and then thrown away, the starch being allowed to pass through the sieve into the tub below. When sufficient starch has been collected, about 4 inches, the water should be allowed to stand for about ten minutes and then poured off. Fresh, clean water should then be added and the starch stirred up, again allowed to settle, and the water poured off. This will have to be done eight or nine times, until the starch is quite white and the water not discoloured. The starch should then be allowed to dry where it will not be contaminated by dust.

To make tapioco flour, the masses of starch are broken up and spread over large iron pans or plates, and gently heated.

To make pearl tapioca, the dry powdered starch is slightly moistened and placed in small quantities in a cradle or hummock-shaped frame, covered with canvas. The whole is then rotated or rocked until it forms shot-like masses, which are afterwards spread out on large plates and gently heated over a fire.

Harvest Report, 1914.

BATHURST EXPERIMENT FARM.

R. W. PEACOCK, Manager.

THE review of a season with its problems is always interesting, as two seasons are never alike. Different phases of agriculture and its fortunes are presented, and much is added to that fund of practical experience which assists materially in the application of the best practice in future years.

The season proved a satisfactory one at this farm. The total rainfall was good, being only about three-fourths of an inch below the average, and, though the distribution was not satisfactory from a main cereal point of view, excellent rains fell at the end of the first quarter ensuring an early and vigorous start, which augured well for good results. The main shortage occurred during the winter months and early spring, but more than sufficient fell during the last quarter, a large proportion not helping the development of the crops and rather retarding the harvesting. Considerable difficulty was experienced in the gathering of the hay crops.

These conditions favoured, as above-mentioned, a heavy development of the early-sown crops, which were checked by the dry early spring, especially where the land had not been fallowed. The early-sown crops upon the fallowed areas withstood the conditions much better and more satisfactorily.

The heavy rains at early harvest time favoured the late-sown crops, the growth of which had not been so rank as to be affected by the dry period of winter and early spring, with the result that many of these made a very much better showing than they would have done under normal conditions.

The main feature of the season was the disastrous effect of unseasonable frosts—12 degrees on the 26th and 9 degrees on the 27th September—in combination with a shortage of soil moisture.

The spring was considerably earlier than during normal seasons, and the crops were more susceptible than ordinarily on the dates mentioned. The action of the frosts was rather peculiar. In some instances the whole plant was checked so that it did not produce grain, in others half the stool was destroyed, and in others, again, there were intermediate gradations. It was extremely difficult to estimate the damage caused, but in several cases it was considerable.

Upon the areas which required more moisture for the development of the crop, the results of frosting were most serious. From careful observations made throughout the farm it was apparent that the combination of shortage of moisture with the frosts was unquestionably accountable for the losses, which would not have occurred if either one of the factors had been absent.

The lesson to be learnt is the value of fallowing, in storing soil moisture as a preventive in some measure from frosting.

The crops dealt with are those of the Demonstration Area, which is separate from the experiment areas. In the main they were grown upon commercial lines, and as such they are of special interest to the farmer. The returns were highly profitable. A few varieties, which would not have been grown under strictly commercial conditions, were sown because they were required for the production of pure seed for Departmental purposes.

The system of farming followed upon this area is a mixed one, sheep being grazed in conjunction with the growth of main winter cereals.

Rotation.

The combination referred to allows of a profitable crop-rotation—in this instance a two-course one. The area is practically divided into two portions, one being under main cereal crops and the other under fodder crops for sheep in alternate year, the portion under main cereal crops in one year being brought under fodder crops the next.

Short Fallow.

The system allows of a short fallow of approximately five months preceding the main cereal crops. This short fallow conserves moisture, and considerable quantities are carried forward to augment the rainfall throughout the crop's growing season. Generally speaking, this is necessary to obtain maximum yields. During the fallow period, owing in some measure to the moisture conserved and to the weeds killed and humified, plant-food is rendered available which materially assists the early growth of the crops that follow.

Alternating Fodder Crop.

The fodder crop is sown from the middle of February to early March. Formerly the fodder crop consisted mainly of rape and barley in alternate rows, but this year Algerian oats were planted much more extensively than Cape barley, and in future the oats will entirely replace the barley.

The fodder crops are fed off for about five months—approximately from the middle of May to the middle of October—and before the barley, rape, &c., can produce seeds, the land is ploughed and left fallowed until the following March or April, when the main crops are sown. Throughout the fallow period, if rain produces weeds they are destroyed by skim ploughing, as it is imperative that all weeds should be destroyed, otherwise fallowing becomes in no small measure a farce. The weeds pump out moisture and lock up plant-food material, the opposite of which should be aimed at.

The whole of the area placed under main cereal crops for 1914 was treated as above excepting paddock No. 5, and the conserved moisture materially increased the yields, supplementing the rainfall throughout the growing period.

Manuring.

The practice followed is to manure the fodder crops with 56 lb. of superphosphate per acre, and to give a further dressing of 25 lb. to 30 lb. per acre to the main cereal crop at seeding-time.

Check strips were left to ascertain the effect of the dressing at seeding time.

The accompanying table shows the results from the manured and unmanured portions:—

TABLE showing beneficial results of manuring with Superphosphate.

Paddock.	Crop.	Manured.	Unmanured.	Difference per acre.
		bus. lb.	bus. lb.	bus. lb.
1	Cleveland wheat	34 · 0	27 20	6 40
1A	" "	33 20	28 40	4 40
2A	Federation "	30 40	22 0	8 40

Weather Conditions.

The particulars with regard to the season's rainfall may be presented in the following form:—

Months.	No. of Wet Days.	Rainfall.	Frosts.
		Points.	Number.
January	9	134	0
February	7	126	0
March	9	446	0
April...	7	154	7 (first frost, 11th.)
May	8	183	13
June	5	87	20 (snow on 20th.)
July	20	201	14 (" 29th.)
August	6	5	23
September	7	115	17
October	6	227	2
November	10	346	0
December	10	227	0
Totals	104	2,251	96

General Results.

The highest yield was given by Cleveland, viz., 29⅓ bushels. Paddock No. 1A, in which the best crop was grown, suffered very much from the depredations of sparrows, which considerably reduced the yield.

Algerian oats averaged 35½ bushels, the frosts having reduced this yield by fully 10 bushels. The yield of hay was approximately 2½ tons from the area cut for hay in this paddock.

The average yield of wheat was 25 bus. 42 lb. per acre.

The accompanying tabular statement sets out the treatment of the various paddocks, the nature of the crops, and the yields per acre.

Demonstration Area, Bathurst Experiment Farm, 1914.

STATEMENT of Treatment, Yields, &c., of Crops.

Paddock.	Area.	Variety.	Previous Crop.	Treatment.	Seed per acre.	Super-phosphate per acre.	Date sown.	Date harvested.	Yield per acre.	Remarks.
No.	acres.				lb.	lb.	1914.	1914.	bus. lb.	
1	13·11	Cleveland	Cape Barley and Rape.	Ploughed 6 in. deep on 13/10/13; 4 in. deep on 16/1/14; 4 in. deep on 2/4/14.	27	39½	7 April	30 Nov.	29 20	About 1 acre, near the dam, affected by frost.
1A	6·64	Cleveland	Algerian Oats	Ploughed 6 in. deep on 10/10/13; 4 in. deep on 9/1/14; 4 in. deep on 1/3/14.	28½	39½	2 April	28 Nov.	29 22	A fair percentage affected by frost.
2	22·58	Algerian Oats for grain.	Algerian Oats and Rape.	Ploughed 6 in. deep on 17/10/13; 4 in. deep on 20/1/14; 4 in. deep on 9/4/14.	54½	41¼	17 April	26 Nov.	35 18	Seriously affected by frost on the lowest land.
2	6·76	Algerian Oats for hay.	do do	do do	51½	41¼	17 April	9 Nov.	ton cwt. qr. 2 16 0	Estimated yield.
2A	6·88	Federation	do do	Ploughed 6 in. deep on 2/10/13. 4 in. deep on 20/4/14.	36	38	25 April	2 Dec.	bus. lb. 21 57	Federation badly affected by "take-all," about one-third damaged.
	2·65	Rymer	do do	do do	32	38	25 April	5 Dec.	28 54	Frosted.
	1·57	Huguenot	do do	do do	30	38	25 April	8 Dec.	15 32	
	1·98	John Brown	do do	do do	37	38	25 April	5 Dec.	22 36	
5	10·39	Algerian Oats for hay.	Algerian Oats for hay.	Ploughed 6 in. deep on 27/1/14; cultivated on 31/3/14.	55½	64½	1 April	6 Nov.	ton cwt. qr. 1 15 0	Estimated yield.
10	5·87	Bobs	Cape Barley and Rape.	Ploughed 6 in. deep on 31/10/13; 4 in. deep on 24/4/14.	34	38½	28 April	23 Nov.	bus. lb. 23 24	
	·98	Thew	do do	do do	33	38½	30 April	17 Nov.	12 40	
	2·79	Nardoo	do do	do do	29	38½	28 April	24 Nov.	22 5	

Average yield of grain per acre: Wheat, 25 bus 42 lb.; Oats, 35 bus. 18 lb.

Varieties.

The three main varieties recommended for the district are Cleveland for early sowing, Federation for mid-season, and Bobs for late sowing.

Cleveland proved the best of the three mentioned. Federation has not yielded up to its reputation here for several years; it was rather rusty this season, and also suffered badly from "take-all." Bobs gave a satisfactory yield, but the severe storms when it was nearly ripe caused it to lodge rather badly.

Rymer again proved a good yielder and came second to Cleveland. Huguenot and Thew, which gave the lowest returns, should not have been sown on the Demonstration Area, but pure seed was required and no other area was available; the effect was to reduce the average.

Features of the Season.

The outstanding features of the season were (1), good early rains ensuring vigorous early development; (2) a dry, mild winter and a spring that commenced several weeks earlier than in normal seasons; (3) severe frosts at a critical time, combined with dry conditions; and (4) a wet, early harvesting period.

Official Milk and Butter Records.

The following cows, whose records were published in the January issue of the *Agricultural Gazette*, were entered by Mr. A. L. Manning, of "Warragaburra," Bega, and tested on his place for some months, when they were sold to Mr. J. Davies, of Scone, where the test was completed, and under whose name the records were published; he being the owner of the cattle at the time of completion of test:—

Name of Cow.	No. of times Tested.	
	At Bega.	At Scone.
Cluster	8	1
Jessie's Starbright	7	2
Milkmaid 36th	5	3
Carnation Columbrs... ...	2	7
Ballet Girl II...	2	6
Spinet	2	7

Some Insect Pests of Apples and Pears.

W. B. GURNEY, F.E.S., Assistant Entomologist.

WITHIN recent years, codlin moth and woolly aphis, two of the most widespread insect pests of the apple, have been the subject of several articles by Mr. W. W. Froggatt, Government Entomologist, but the intervals since other pests have been equally fully reviewed have been longer, and the following account of the life-history of each, together with the various methods of control, has been prepared in order to put the latest information in a form convenient for reference. Several of these pests are common to both apples and pears, and the scope of the work has therefore been extended to include both.

Thrips.

During the spring and early summer of 1913–14, a thrips, apparently identical with *Thrips tabaci* of our roses, garden flowers, and vegetables of previous years, appeared in vast numbers in apple, pear, and other fruit blossoms, which were responsible for serious losses by preventing the setting of much of the fruit. They were very widespread throughout the State, and were considered responsible for losses varying from a light thinning-out to upwards of 75 per cent. of the crop; there was even much local variation in the extent of the damage. It was observed that, on the whole, the earlier blooming varieties escaped best. In the Bathurst district the pest was most numerous in the fruit blossoms from about the 7th to the 10th October, though it seems they had made their appearance late in September, and were on the increase in the first week in October. From then on they were found in apple and pear blossoms in great numbers, as well as roses and most garden flowers; even weed flowers and bush flowers were found to be infested, and later on tomatoes were attacked and serious damage done to the crops.

It is considered that certain atmospheric conditions may favour the increase of thrips. The winter of 1913 was comparatively mild, and was followed by a dry early summer and some specially warm days in early October—factors that explain the severity of the visitation that year.

The winter of 1914 was not so favourable. There was a good deal of rain in many coastal and tableland districts in September and October, and it was noticeable that the thrips were not nearly so much in evidence and that the damage was correspondingly less.

Previous to 1913 this particular thrips had confined its attacks mainly to garden flowers, though a local attack upon pear blossoms had occurred in the Sydney district. In Victoria, however, it has for some years been a serious pest in certain orchards.

The thrips is a minute insect, only about 1-25th inch (1 mm.) long, of a yellowish to yellow-brown colour, with two pairs of delicate little wings fringed with very fine long hair, and they are often, therefore, called "Fringe-wings" (*Thysanoptera*)—(see illustration). However, these features are only distinguishable with a lens or microscope, and to the grower examining a blossom all that is to be seen is extremely tiny, lice-like, and active little insects crawling among the petals and stamens.

All stages of the insect may sometimes be found in the flowers, from the tiny young to the adult form described, the broods being somewhat irregular. It seems the thrips winter as adults in weeds, refuse, and crevices, and they have been recorded from the dead tops of onions left in the field. In most districts they become active by the end of September, and spread to the fruit trees and enter the blooms as they begin to open, infesting them until they are full blown and the petals are dropping.

Life-history.—The development from egg to adult occupies about twenty days under warm conditions, but the growth is slower in cool weather. The clear, whitish eggs are extremely minute, and are deposited in the twig and flower tissue by means of a tiny curved ovipositor at the tip of the abdomen of the female. The egg hatches in four days to a week into a tiny pale yellowish-white thrips, much resembling the adult, but without any wings. It feeds by means of small pointed mouth-parts, which are capable of gnawing off the surface tissues of blossoms, twigs, and leaves. After feeding and growing for about two weeks, during which time it casts its skin three times, the thrips becomes adult and winged. These wings are held folded straight down the back, and are scarcely distinguishable when the insect is crawling in the flowers, though it can open them and fly off readily. There are a number of generations during the summer months. Towards late summer there is a decrease in the thrips, though a few remain in different flowers even into the winter months.

Controls.—Orchardists are urged to thoroughly turn under green manure, weeds, and dead matted grass or refuse in the orchard before the end of August. The ground should be ploughed as close to the trees as possible to disturb and expose any sheltering thrips, and lessen the chance of them spreading to the fruit trees at the time the buds are beginning to open. A lime-sulphur* wash, just before the buds begin to swell, would be useful in destroying any which may have reached the trees or are sheltering in crevices. As the buds are opening, tobacco wash is advised—1 lb. tobacco refuse to 2 gallons water, with 2 oz. soft soap. The tobacco waste is steeped in very hot water for an hour or two—the longer the better—but should not be boiled too long, as the high temperature tends to drive off much of the volatile substances of the decoction. This spray should be used again on the open blooms, and will destroy all the thrips it hits. It is advisable to have as strong a pressure as possible to aid in driving the spray well into the

* Full instructions for making and applying sprays have already been published in the *Agricultural Gazette*, and are obtainable free on application to the Under Secretary and Director, Department of Agriculture, Sydney.

blooms, and also to spray at all angles possible, as otherwise too many of the thrips sheltering deep within the blossoms escape, and the work may need continual repetition. The addition of the soap gives much greater sticking and penetrating power to the spray, but it is, perhaps, advisable not to use any more soap than is recommended above on open blooms. There are several commercial preparations of nicotine on the market, which, with the addition of soap, can be used at suitable strengths, to take the place of the decoction of tobacco refuse.

A solution of ½ oz. benzole to 2 gallons water, with 2 oz. soft soap, can be used, and is found effective for killing thrips without burning even the most delicate blooms.

The use of distillate oil (a commercial name for some Californian spray oil), in about a 1 per cent. addition to tobacco sprays, has not yet been tested here, and cannot therefore be recommended, more especially as most oils so readily burn blossoms.

San Jose Scale (*Aspidiotus perniciosus*, Comst.).

This tiny round scale, if neglected, is apt to be a serious pest in deciduous orchards and in nurseries, attacking, as it does, not only apple and pear, but cherry, plum, peach, apricot, almond, and other trees. It appears on the twigs, foliage, branches, and trunk, and sometimes affects a quantity of the fruit. When plentiful on the bark, it gives it an ashy-grey appearance, and rubbing a knife-blade along the affected bark removes numbers of the scales, revealing and crushing the yellowish soft insects beneath. A characteristic effect of its presence on young green twigs and on the fruit is to produce a reddish ring in the tissue about each scale or cluster of scales, which peculiar colouring often first indicates to the grower the presence of the minute scales. Lifting a single scale with a pin point, the minute, rounded, yellowish-coloured, and motionless insect is seen beneath. The male develops similarly to the female, but the scale is somewhat smaller and more oval-shaped, while the adult male emerges from beneath its scale as a minute two-winged flying form, which, almost invisible, flies off and impregnates the motionless females, which never leave the cover of their protecting scales.

The effect of the presence of this scale in quantity is to drain the sap from the trees, and young trees, if neglected, may perish within two or three years. As will be realised, infested nursery stock may prove a source of infection by spreading the pest into many widely scattered orchards, and care should therefore be exercised to fumigate or otherwise treat all stock prior to sending it out.

Life-history.—The partly-grown scale insects remain somewhat dormant through the winter, but commence feeding during spring. The females reach maturity during early summer, and the males also become adult and fly off, principally at night, to fertilise the quiescent females. These fertilised females, some four weeks later, give birth to living young—tiny six-legged mite-like creatures. Most scale insects lay eggs from which the young hatch, but in giving rise to young viviparously, the San José scale differs from most.

The minute, yellowish-coloured larvæ are very active, crawl from beneath the mother scale, and scatter over bark, leaves, and fruit. Within about one and a half days, however, these young settle down, insert their sucking-beaks to suck up the sap, and feeding thus, at the expense of the tree, grow, moult, and exude the scale which covers them. The scale over the insect first appears as a series of waxy filaments, which mat together in concentric layers, and increase the size of the scale along with the growth of the insects beneath. The scale itself varies in colour from dirty whitish to greyish colour, and even black in old scales, with a central boss or nipple of a yellowish tint. The eyes, legs, and antennæ of the six-legged larva are lost at the first moult, which occurs twelve days after the larva settles down on the bark; then, in about ten days' time, the second moult occurs, and the female, having gradually matured, is capable, about eighteen days later, of being fertilised and, later, of giving birth to young. Thus, from birth to maturity, the life may be thirty-three to forty days, but cold conditions may lengthen the period. The female may, on an average, produce some 400 young, hence the rapid increase of this scale on a tree. It seems probable that as many as four generations occur in our warmer districts each season, and not so many in colder parts.

Controls.—Nursery stock, being so liable to introduce even a few scales into orchards, should be subjected to the fumes of hydrocyanic acid gas* for forty minutes.

Infested trees in the orchard should be sprayed with lime-sulphur wash as late as possible, say, not later than ten days before the buds burst. Dilute lime sulphur wash, as recommended in the *Agricultural Gazette* of July, 1914, should be used. If an earlier spraying in the winter, after pruning and before the sap begins to rise, is used apply the stronger wash mentioned in the above-quoted *Gazette*. This contact wash should be applied thoroughly to reach every part of the wood of the tree. In lieu of the lime-sulphur wash, the use of red oil emulsion, or even fumigation with hydrocyanic acid gas, may sometimes be found practicable, and is effective in control. The spring spraying with lime-sulphur seems effective for slightly infested trees, but an earlier winter wash as well may be advisable in the case of badly infested trees.

Of natural control, it is to be noted, several small black ladybird beetles and small species of predaceous moth larvæ feed on the San José scale in New South Wales, but though they certainly reduce the pest in varying degree, yet their appearance is too erratic and uncertain to warrant reliance on them for control of the pest.

Mussel Scale (*Mytilaspis pomorum*, Bouche).

This brown, very elongate scale affects apple and pear trees the world-over. The scale of the female is a dark-brown, elongate object, shaped like a mussel-shell, and in length about one-eighth inch when full grown. The male scales

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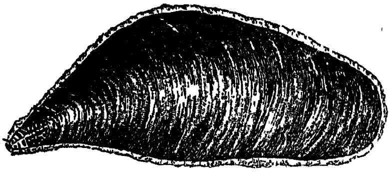
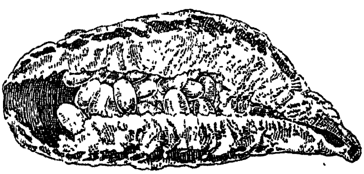
* Full instructions for spraying or fumigating have already been published in the *Agricultural Gazette*, and are obtainable free on application to the Under Secretary and Director, Department of Agriculture, Sydney.



Female Mussel Scale, upper side much enlarged.



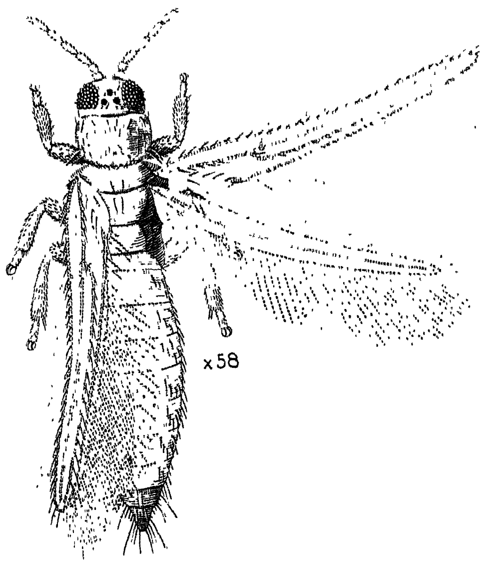
Female Mussel Scale, under side, much enlarged, showing eggs.

Fruit attacked.

Wood attacked.

Mussel Scale (*Mytilaspis pomorum*).

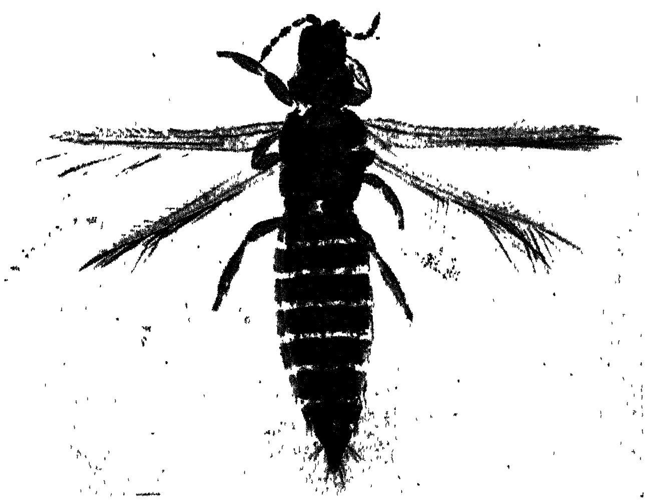
SOME INSECT PESTS OF APPLES AND PEARS.



Drawing of Thrips which attacks Apple and Pear Blossoms, &c.

DESCRIPTION.

Body pale brown to yellowish colour. Length, about 1-25th inch (1 mm.).
Head broader than long; antennæ 7-jointed; three reddish-tinted ocelli triangularly arranged between the compound eyes.
Fore-wing fringed with long hairs, and the posterior or second longitudinal vein bearing about 17 bristles.
Hind wing fringed with single longitudinal vein.
Leg showing single-jointed tarsus (or foot) and bladder-like extremity.
Abdomen with pointed extremity, below which the curved ovipositor, which slits the plant tissue when egg-laying, is present in the female.



Thrips which attacks Apple and Pear Blossoms, &c.

(From actual photograph, much enlarged.)

SOME INSECT PESTS OF APPLES AND PEARS.

are much smaller and narrower, dirty white in colour, and not curved in outline. The female scales are, of course, readily detected with the unaided eye, giving the bark a very roughened appearance when well covered with the pest; the lens reveals the smaller male scales present among the others. If we examine the female in late winter, the scales will generally be found to be covering a mass of from twenty to eighty minute, whitish, oval eggs. The eggs hatch into tiny six-legged active young, which crawl from beneath the mother scale and scatter over the bark, about October and November, that being about the time the blossoming is over. These young soon settle down, insert their proboscES, and, feeding and moulting, exude their scales. The females are full-grown in two or three months' time. The males develop into minute two-winged flying forms after their last moult. There seems to be generally two generations of the scale during the year in our orchards.

Control.—Spray in midwinter with red oil emulsion or lime sulphur wash.

Apple-root Borer (*Leptops hopei*, Schon.).

These beetles are grey-brown in colour, and over half an inch long generally, though variable in size; the males are generally smaller than the females. The head bears a snout in front, and a pair of elbowed feelers, characteristic of the weevil beetles; the abdomen is the broadest part, especially towards the hinder end, where the wing-covers have two prominent swollen angles. The wings are aborted, and the insect cannot fly from tree to tree. The chief damage is done in the grub stage, when it attacks the roots and gouges out channels or tunnels in them. Eventually it may cause the terminal branches to die first, and finally, if the infestation is bad, the whole tree dies. The adult beetles are leaf and bud eaters, and are sometimes a pest of grape vines and fruit trees.

Life-history.—At night the female weevil crawls on to the twigs, and if ready to lay eggs, folds over a leaf and brings the edges together, fastening them with a gummy secretion. In the shelter so obtained she deposits her eggs, which may number upwards of forty, between the folds of the leaf. These eggs hatch shortly into small grubs, which, however, do not live on the foliage, but drop or descend to the ground and burrow down to the roots, on which they feed, gnawing out longitudinal channels and boring in the roots distances up to several feet. The grubs are yellowish-white, thick, fleshy, and legless larvæ, and when full grown, they pupate in a loose cocoon formed in the furrows or bores they have made. The pupæ change to the adult beetles, which push their way through the soil to the surface, and crawl on to the trees.

Controls.—To reduce the number of adult beetles, hand-picking can be resorted to, or jarring the trees over a sheet, which dislodges many which can then be collected and destroyed. Arsenate of lead* sprayed on to the foliage destroys a percentage of the beetles as they feed on the leaves and

* Full instructions for making and applying sprays have already appeared in the *Agricultural Gazette*, and are obtainable free on application to the Under Secretary and Director, Department of Agriculture, Sydney.

buds. But trees which show signs of affection of the roots require the butts and roots to be uncovered, and the grubs or pupæ exposed can be destroyed.

Pear and Cherry Slug (*Selandria cerasi*).

In nurseries and orchards this pest appears generally as groups of tiny dark olive green, slug-like grubs on the foliage, which gnaw the tissue, skeletonising, and eventually riddling and destroying a considerable amount of the foliage.

Life-history.—The adults are small black saw-flies, narrow bodied, and with four smoky gauzy wings. These are very seldom seen, but the female, with the tiny ovipositor called a saw, from which we get the name "Saw-flies," slits the tissue of the leaf, and deposits an egg in each little slit. The egg hatches in about two weeks' time, and the tiny grub, at first whitish, soon becomes yellowish, which is its colour through life as a grub, but this colour is hidden by the characteristic greenish, slimy, matter which the grub exudes and covers its body with. Hence they are referred to as "slugs." In three or four weeks' time the larva is full-grown, though less than half an inch long, and it crawls down and into the soil to a depth of an inch or two, where it forms a small oval cocoon of earth and saliva. These cocoons are often aggregated in clusters of a dozen or more in the soil. The pupæ of the last generation remain over winter in the soil, emerging and pushing their way out of the soil during the following spring.

Controls.—The grubs on the foliage are readily destroyed with arsenate of lead wash. Failing this, dusting with lime, tobacco dust, hellebore, or even road dust will destroy a large percentage of the slimy grubs on the leaves.

Brown Apple Moth (*Cacaecia responsina* (*postvittana*) Walk.).

The grubs of this moth have a habit of eating into the fruit in a manner similar to the codlin moth grubs, and have now and again been recorded as doing damage in South Australia, Victoria, and New South Wales.

Control.—The same as for codlin moth.

Shot-hole Borer (*Xyleborus solidus*, Eich.).

This little black beetle is a growingly serious pest of apple, pear, plum, and other deciduous fruit trees. They bore into the trunk and limbs of a tree, eating out cylindrical bores for some inches up or down the stem, and frequently then making a circular tunnel girdling a branch within the woody tissue, so weakening the stem as to cause it to die back or break, and in any case, if many beetles are present, weakening the tree so much as to cause the death of part or the whole. It has been noted that these beetles seem to prefer already weakened or sickly trees from whatever cause, and frequently only isolated trees are singled out and freely attacked, while trees near by may escape. Sometimes, however, a dozen or more trees may be affected. The adult beetles in early summer may be seen on the bark of affected trees, or in the openings of their bores. The bores open by a neat circular hole, showing fresh sawdust within or below, where it has dropped on to lower

limbs or the ground. These holes and tunnels within, as seen when the limb is split open, later become quite blackened, as if scorched. The very small clear-cut round openings of these bores, as seen in the bark, have given rise to the name Shot-hole Borers. The curious feature of the life of this beetle is, that the adult beetle mainly does the boring, and the grub only tunnels slightly, if at all, while in the case of other beetle borers it is the grub which does the damage. Further, the grubs of the shot-hole borer feed on a fungus growth which develops in the tunnels, and not on the woody tissue of the tree, and hence they are sometimes called fancifully "Ambrosia" beetles.

Life-history.—In spring the adult beetles hatch from pupæ in the tunnels, and pass out to commence to bore into the same or another tree. After constructing the tunnels, the female beetle plants a fungus, or prepares a medium for a special fungus growth, and amongst this fungus, which grows and spreads in the tunnels, she lays her eggs. The grubs on hatching feed and develop wholly on this fungus, the adult beetles also feeding on the fungus, and thus colonies of beetle grubs develop and, when adult, spread the infestation. The adult is a tiny black cylindrical beetle, truncate behind and also in front, the small head being hidden under the relatively large thorax, as occurs in many species of the family *Scolytidæ*, to which this beetle belongs.

Controls.—Cut out and burn all badly infested wood or dead limbs which might be expected to contain the beetles; larger prunings of infested trees are also best burnt. Liberally fertilise or otherwise stimulate the growth of trees which have been or are being attacked, to aid them to withstand the attacks. A repellent wash for trees that are attacked, or adjacent to trees attacked, is made by a soft-soap wash containing 1 pint of crude carbolic acid to every 15 or 20 gallons of water; this is painted or sprayed on to the limbs and trunks. Similarly, whitewashing in early spring and again in midsummer has been recommended as a repellent.

Red Mite (*Bryobia pratensis*, Garman).

A characteristic reddish or pinkish tint on the trunk and limbs of apple and pear trees through the winter months may often be noted in patches on the trees. This frequently proves to be due to vast numbers of the minute reddish eggs of the Red Mite, which are laid in thousands touching each other. Each egg is rounded, circular on the top, which is somewhat flattened, and within is the unhatched reddish mite that gives the colour, for on emergence the empty egg-shells remain as a whitish coating on the bark. In the spring these young mites hatch, and spread over twigs and leaves. Their shape can only be made out with a lens; they are found to be oval, with eight legs, and resemble extremely minute spiders, to which they are more nearly related than to the six-legged insects.

Control.—Wet weather destroys numbers, dry conditions favouring their increase. They can be controlled readily by lime-sulphur wash or red oil sprayed on in winter or early spring, the effects being to destroy the eggs and any young that may have hatched.

C

Pear-leaf Blister Mite (*Eriophyes* (*Phytoptus*) *pyri*, Pgst.).

This mite, microscopic in size, scarcely visible to the naked eye, principally affects the foliage and twigs of apple and pear trees, and though not serious, yet as a pest it is capable of becoming more serious if neglected. They cause small greenish or reddish coloured blisters in the tissue, and these blisters may run together and form continuous irregular blister like swellings, much tinted with red, and distinctly visible generally on the terminals and leaves. The effect is to cause the leaves to decay and fall. Within these blisters, by careful examination, the very minute mites may be discovered with a strong lens; they are elongate in shape, and whitish in colour, the legs placed well forward, just behind the head and in front of the long abdomen.

Life-history.—The adult mites hibernate during winter on the twigs and buds, and in the spring begin to move and feed on the tissue, into which they burrow, eventually causing the blisters, within which are deposited the eggs. The eggs hatch in about seven days' time, the young mites spread, and themselves produce more blisters The last generation, on the approach of winter, seek shelter on the twigs and branches, and hibernate.

Controls.—As the last leaves are falling before winter, many mites on the twigs can be destroyed by spraying with kerosene emulsion (1 in 10) or red oil emulsion, or lime-sulphur wash. If the infestation has been bad, spray again with lime-sulphur wash, as for San José scale, just before the leaf buds begin to open in spring. If the trees are only slightly affected, pruning out and burning infested twigs will often prove sufficient.

Pear and Cherry Tree Borer (*Cryptophaga spp.*).

This moth is a native tree-borer in its grub stage, and it has taken to attacking the pear and cherry trees, also various introduced shade trees. The result is that limbs and small branches may be weakened or killed, or snapped off—wind, or a heavy crop of fruit, being sufficient to complete the damage.

Life-history.—The adult is a large silky white moth, which is, however, rarely seen, and itself does not do any damage, except that it is responsible for laying the eggs on the bark which eventually give rise to the destructive boring caterpillar. This caterpillar or grub is of a dirty white colour and brownish at the head end, and tunnels some inches into the branches, generally at a fork; it also gnaws off some adjacent bark, and sometimes thus girdles a branch more or less deeply and irregularly at this point. The opening of the bore and girdled portion is often covered with a conspicuous mass of silk and excrement. The bore is often only some 2 to 6 inches deep, as it forms merely a shelter or home for the grub, which at night crawls out to feed on the adjacent foliage; often portions of leaf are carried back to the opening of the bore. The grub pupates within the bore, and the adult moth emerges to produce further generations.

Control.—It is possible to discover the limited number of bores in a tree, and to insert wire into each bore after removing the covering excrement at the opening. The slightest damage to the grub by thrusting in the wire will cause its death eventually. A little kerosene or other oil squirted into the bores also destroys the grubs.

The Fruit Fly (*Ceratitis capitata*, Wiedm.).

Although chiefly a pest of oranges, peaches, and nectarines, the fruit fly maggots are sometimes slightly destructive to apples and pears, and have been recorded in the New England districts as temporarily present.

Life-history.—The habits and development of this fly are given fully in Farmers' Bulletin, No. 90, "Citrus Culture." It is sufficient here to note that the females puncture the skin with their ovipositors, and deposit eggs beneath. These eggs hatch into maggots, which at once feed and bore into the fruit pulp, and cause decay and putrefaction. Becoming full-grown in three or four weeks' time, the maggots leave the fruit generally, and crawl into the soil to pupate, but occasionally remain in the fruit and pupate there. Many of the affected fruit fall prematurely. Two or three weeks later the pupæ emerge, and the adult flies push their way up through the soil and escape, to continue the infestation. But if winter is approaching, then the pupæ remain as such in the soil, the flies not emerging till the following spring. Many pupæ seem to be destroyed by wet or rigorous winter weather.

Control.—Spraying cannot be resorted to, as this maggot is a hidden feeder. It is essential, therefore, and enforced by the Vine and Vegetation Diseases Act, that growers pick up and destroy, by burning or boiling, infested fruit every day—or, in the case of citrus fruit, every three days at least. This is to prevent the escape of the maggots from infested fruit into the soil, and is a protection advisable in the interest of all growers, as, of course, the flies readily spread on the wing to immediately adjacent orchards. Turning up the soil around the trees exposes many pupæ that may happen to be in the soil to birds, other insects, and to wet and cold, and is, therefore, to be recommended.

Painted Acacia Moth (*Teia anartoides*, Walk.).

Among the minor pests of apple-trees may be mentioned the Painted Acacia Moth (illustrated November, 1896, *Agricultural Gazette*), which, though a native moth that feeds on various wattle trees, attacks also the foliage of cherry, apple, rose, pelargonium, and other garden plants. The male of this moth is small, rich brown colour on fore wings, and bright yellow on hind wings, towards the bases, the outer half with broad encircling band of dark brown; it is thus rather a strikingly coloured species. The female, however, is a wingless, insignificant, fluffy-bodied creature, which does not leave the precincts of the hairy cocoon it constructs, and in or upon which it deposits some hundreds of the small white eggs that give rise to the hairy caterpillars sometimes discovered in numbers on odd trees throughout the orchards. These caterpillars are brown, hairy, and characterised by a series of four large erect tufts of buff-coloured hairs on the upper surface of the body. They reach about an inch in length, and then spin a loose silken cocoon, thickly matted and bristling with the numerous hairs shed from the last caterpillar skin. The pupa within is visible through the loose walls of the cocoon, and, as mentioned, only the male pupa changes to the winged state, the female pupa giving rise to the wingless, sluggish female moth that is only capable of

crawling about the cocoon. The caterpillars are sometimes numerous enough to almost strip a tree of foliage, but can be readily destroyed by arsenate of lead spray; even hand-picking of any cocoons noticed will control the pest.

Emperor Gum Moth (*Antheraea eucalypti*, Scott).

Another native moth, the caterpillars of which attack apple foliage occasionally, is the Emperor Gum Moth. Their natural food is eucalyptus foliage, but they appear commonly on the leaves of pepper-trees. The eggs are white oval-shaped objects, laid on the leaves in irregular rows of two or three to a dozen or so. The caterpillars on emerging are mainly black in tint, but soon they assume green colours, and as they become half to full grown are bright green, vividly marked with orange and blue-tipped fleshy tubercles on all the segments, and as they attain a length of 4 to 5 inches, and are thick as one's little finger, these caterpillars form striking objects, though not readily visible, owing to their green colour. They are capable of destroying a large quantity of leaves, but are not generally numerous enough to be serious. When full grown the caterpillars spin large oval brown cocoons attached to the twigs. The moths are large light-brown moths, about 4½ inches across the expanded wings, which are marked with circular eye spots.

Controls.—Hand-picking or spraying the foliage with arsenate of lead.

Grey-streaked Climbing Cutworm (*Prodenia littoralis*, Boisd.).

A third moth occasionally found on apple foliage in its caterpillar stage is the Grey-streaked Climbing Cutworm (illustrated in *Agricultural Gazette*, November, 1896). The moth is small, greyish-brown, marbled with silvery lines on the fore wings, while the hind wings are pale silvery white and almost transparent. The moth lays her eggs on the under side of the leaves in clusters, and covers them with short velvety down from the hind part of her body. The grubs or caterpillars at first feed on the epidermis, but later eat through the whole thickness of the leaves. When well grown they are deep green in colour, and when about to pupate crawl down into the loose soil below the trees to change to the pupal stage.

Controls.—Pick off leaves bearing eggs or young caterpillars, or spray with arsenate of lead to poison the caterpillars.

English Leicesters for Sale.

As the experiments in crossing with the English Leicesters have now reached their final stages, the Department has decided to dispose of its small flock, and invites inquiries from possible purchasers.

The whole of the sheep for disposal have been registered in the Flock Book of the Australian Longwool Breeders' Association.

Strawberry Clover from Seed.

A Method of Improving Germination.

W. M. CARNE, Botanic Gardens.

Every visitor to South Gippsland, as well as every resident and land-holder there, is loud in the praises of strawberry clover (*Trifolium fragiferum*) for dairy stock. In the words of Mr. Younger, of the Victorian Department of Agriculture, it "has proved its exceptional fattening qualities that the stock . . . have for many years realised the highest prices in the Melbourne yards. It will hold its own against any other grass in flats, swampy land, wet or marshy places; stands flooding even with brackish tidal waters, and grows much fodder during summer. Horses prefer it to all other grasses."

As satisfactory results have not been obtained from the sowing of seed, the usual practice is to use roots. Clover sod is cut up into small pieces, broadcasted, and rolled in, or else the roots are hoed in amongst grass. A bag of about 2,000 roots costs about 20s. to 25s. to bring from Victoria, while seed costs about 6s. per lb. in the husk, containing ½ lb. or about 200,000 seeds. It is obvious that if a satisfactory stand could be obtained from seed this method would be cheaper and more convenient than the use of roots.

At the request of the Agrostologist, an investigation was made to ascertain the reason of the poor results obtained from seed, and whether these results could be improved. In a series of eight tests it was found that the percentage of seed capable of germinating averaged 4 per cent. Such a germination is not capable of producing a stand under ordinary field conditions. It was evident that the low germination was due to the very high percentage of hard seeds—*i.e*, seeds which, owing to the nature of their skins, are unable to absorb the water necessary for germination. Clovers usually contain 10 to 20 per cent. of hard seeds, but in strawberry clover they run to over 90 per cent. Various methods were tried to induce these hard seeds to germinate, either by the use of hot water or acids, or by scratching the surface of the seeds. The latter was found to be the most effective for ordinary purposes. The method adopted was as follows:—

The seed, in the husk, was spread, a handful or two at a time, on a large stone, such as a convenient doorstep. A piece of flat sandstone about 2 lb. in weight, and of a size convenient to handle, was then passed several times over the seed without pressure, the object being to hull and scratch the seed without crushing an excessive number. The seed and hulls were then swept into a convenient receptacle and the operation repeated. About fifteen minutes was required to treat 1 lb. By this method the germination of the seed was raised from about 4 per cent. to 60-80 per cent. About 15

to 20 per cent. of the seeds were crushed in the process of treatment. The seed germinated readily, and a good stand was easily obtained under favourable conditions.

If sown in a nursery bed, ¼ lb. of seed in the husk would yield about 40,000 plants for planting out. For field sowing in moist soils on river flats and about swampy places on the coast 2 to 3 lb. of treated seed should be sown to the acre. Once established, the seed is spread in the dung of animals. Germination is probably aided as a result of the passage of the seed through the animals.

Though able to stand very moist and marshy conditions, it must not be considered that these conditions are essential for success. In the present experiments good results were obtained in light well-drained soil only moderately moist.

"Stink Grass" (*Eragrostis major* Host).

Recently a Boggabri resident submitted for identification a sample of what is known as "Love Grass" in that district. He stated that the grass grew well in the wheat paddocks, and gave a fair amount of summer feed, particularly on the lighter soil. "On this light soil it grows better and gives more feed than any other plant we have."

In reply, Mr. E. Breakwell, B.A., B.Sc., Agrostologist, states that the grass is *Eragrostis major* Host, commonly known as "Stink Grass," an introduced variety from America.

It must not be confused with *Eragrostis brownii* (Brown's Love Grass) a somewhat similar native grass from which it can be distinguished by the presence of marginal glands on the leaf. *Eragrostis major* is a common weed on cultivated and fallowed lands throughout the State. It is not considered either here or in the United States as a desirable grass to place under cultivation. It has a short-lived habit, lasting only for a period of two or three months, and if the stock show at any time a preference for the grass it is only when the flag presents a verdant appearance during the first few weeks of its development.

The odour which is emitted from the scent glands, situated on the margin of the leaf, and which is particularly strong in the presence of dew or rain, is objectionable to stock.

These disadvantages probably account for the absence of the seed on the market. Judging by the manner in which the grass is spreading it will establish itself on wheat or other cultivated areas without sowing the seed, and, generally speaking, may be placed in the same category as barley grass.

[An article on this grass by the Government Botanist, Mr. J. H. Maiden, appeared on page 577 of the July issue of the *Agricultural Gazette* for 1912. This was supplemented by an illustration by which the plant could be easily identified.—Ed.]

List of Fertilisers in New South Wales.

F. B. GUTHRIE, A. A. RAMSAY, C. R. BARKER, AND L. A. MUSSO.

1915 List.

THE accompanying list of manures obtainable in New South Wales, together with their composition, as guaranteed by the vendors, and their values, is the result of the revision of the list issued in March, 1914.

The list is published in the interest of the farmers, and it is hoped that it may serve as a guide to those requiring any particular class of manure.

It must be clearly understood that the figures given are not those obtained by analysis of the sample by the Department. They represent the guarantees given by the vendors in accordance with the provisions of the Fertilisers Act.

Where possible, samples have been taken from bulk by one of the officers of the Department, and only those manures are inserted in the list which have been found on analysis to be up to the guarantee.

A word is necessary in explanation of the column giving the "values" of the manures. These figures are calculated from the composition of the manures as represented by analysis, a definite unit-value being assigned to each of the fertilising ingredients. The units on which the values here given are computed are as follow :—

UNIT-VALUES of fertilising ingredients in different manures for 1915.

	Per unit. s.	d.
Nitrogen in nitrates ...	18	0
,, in ammonium salts ...	15	4
,, in blood, bones, offal, &c.—fine ...	15	11
Nitrogen in Nitrolim...	15	7
Phosphoric acid in bones, offal, &c.—fine ...	3	0
Phosphoric acid in superphosphate and mineral phosphate—		
Water-soluble ...	5	0
Insoluble ...	2	11
Potash in sulphate of potash ...	*	

PRICE per lb. of fertilising ingredients in different manures for 1915.

	Pence per lb.
Nitrogen in nitrates ...	9·6
,, in ammonium salts ...	8·2
,, in blood, bones, offal, &c.—fine ...	8·5
Nitrogen in Nitrolim ...	8·3
Phosphoric acid in bones, offal, &c.—fine ...	1·6
Phosphoric acid in superphosphate and mineral phosphate—	
Water-soluble ...	2·7
Insoluble ...	1·6
Potash in sulphate of potash ...	*

* On account of the absence of supplies of Potash owing to the war, no unit-value can be assigned to this ingredient.

To determine the value of any manure the percentage of each ingredient is multiplied by the unit-value assigned above to that ingredient, the result being the value of that substance in the ton of manure. For example, a bone-dust contains 4 per cent. nitrogen and 20 per cent. phosphoric acid :—

4 x 15s. 11d. = £3 3s. 8d. = value of the nitrogen per ton.
20 x 3s. 0d. = £3 0s. 0d. = value of the phosphoric acid per ton.

£6 3s. 8d. = value of manure per ton.

It must be clearly understood that the value thus assigned, depending solely upon the chemical composition of the manure, does not represent in all cases the actual money value of the manure, which depends upon a variety of causes other than the composition, and is affected by local conditions; neither does it represent the costs incurred by the manufacturer in the preparation, such as cost of mixing, bagging, labelling, &c., nor freight. It is simply intended as a standard by which different products may be compared. At the same time, it has been attempted to make the standard indicate as nearly as possible the fair retail price of the manure, and the fact that in the majority of cases the price asked and the value assigned are fairly close shows that the valuation is a reasonable one.

Some agents guarantee two figures—for instance, "from 16 to 18 per cent. phosphoric acid." In these cases the lower one has been published in the list, as it will certainly be the one the vendors will rely upon in cases of dispute.

Now that the Fertiliser Adulteration Act is in force, the purchaser has only himself to blame if he pays for an inferior article. Every vendor is obliged to furnish a guarantee with every delivery of fertiliser, setting forth its actual composition as determined by analysis.

If the purchaser has any reason to suspect the genuineness of the guarantee, all he has to do is to notify the vendor of his intention to take samples for analysis, in sufficient time to enable the vendor or some person appointed by him to be present. The samples must be taken before the consignment is finally in the purchaser's possession; for example, if the fertiliser is sent by rail, the sample should be taken at the railway station or siding. Three samples must be taken, one being given to the vendor or his representative, the second kept by the purchaser and submitted to an analyst, and the third forwarded to the Department of Agriculture for future reference, in case of divergence in the analyses of the other two. All three samples must be sealed.

In the case of bone-dust, blood and bone manures, &c., the valuation has been made irrespective of the fineness of division, and is based on the amounts of fertilising ingredients only; but it must be borne in mind that finely ground bone-dust acts more rapidly than coarse, and that unground fragments of bone only become available as fertilisers very slowly.

A word may be added in explanation of the term "water-soluble phosphoric acid." When bones or mineral phosphates are acted on by sulphuric acid, a

portion of the tricalcic phosphate is converted into another lime compound, known as monocalcic phosphate or superphosphate. This compound is soluble in water, and it is to its presence that the rapid action of the phosphate is due. This is the "water-soluble" acid of the table. In many superphosphates, however, a considerable portion of this compound has undergone change. This change may be due to the salts of iron and alumina present, or to the length of time it has been kept, and it results in the formation of a third lime compound—bi-calcic phosphate. This is known as "reverted" or "retrograde" phosphoric acid, and is insoluble in water, but soluble in ammonium citrate.

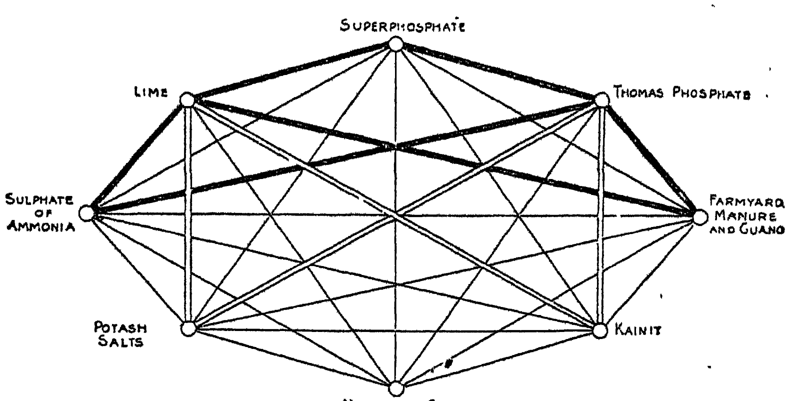
In the fourth table are a number of waste products which may in many cases be utilised economically.

When purchasing a manure, always insist on a guarantee of its composition as determined by analysis.

Artificial manures should be mixed with about three times their weight of dry loam, and distributed evenly.

Never add lime to a manure containing sulphate of ammonia or blood and bone manures, as in these cases loss of nitrogen results; and when lime has been applied to the land, do not use manures until about three weeks afterwards.

The accompanying fertiliser diagram, which represents in a graphic manner the points to be taken into consideration in the mixing of different manures, is reproduced in the hope that it will be found useful to farmers who make up their own mixtures. The diagram originates with Dr. Geekens, Alzey, Germany, and is taken from an article by Mr. Leo Buring, in the *Garden and Field* of 10th October, 1903.



Substances connected by thick line must not be mixed together.
Substances connected by double line must only be mixed immediately before use.
Substances connected by single thin line may be mixed together at any time

I.—SIMPLE FERTILISERS.

Manure.	Where obtainable.	Guaranteed Composition.					Manurial Value.
		Nitrogen.	Equal to Ammonia.	Lime.	Potash.	Phosphoric Acid.	
							£ s. d.
Sulphate of ammonia ...	Australian Gaslight Co., Kent-street ...	20·4	24·8	......	......	......	15 12 10
" " ...	Geo. Shirley, Ltd., 18–22 Carrington-street ...	20·0	24·29	......	......	......	15 6 8
Kainit ...	" " "	......	......	......	12·5	......	*
Thomas' phosphate ...	" " "	......	......	......	......	17·0	....
Sulphate of potash ...	" " "	......	......	......	52 0	......	*
Nitrate of soda ...	" " "	15·5	18 82	......	......	......	13 19 0
" " ...	Gibbs, Bright, & Co., 37 Pitt-street ...	16·0	19·35	......	......	......	14 8 0
Sulphate of ammonia ...	" " ...	20·5	......	......	......	......	15 14 4
" " ...	Paton, Burns, & Co., 75 York-street ...	20·4	24·8	......	......	......	15 12 10
Kainit ...	" " ...	......	......	......	12·8	......	*
Sulphate of potash ...	" " ...	......	......	......	52·0	......	*
Thomas' phosphate ...	" " ...	......	......	......	......	18·0	....
Nitrate of soda ...	" " ...	15·5	18·82	......	......	......	13 19 0
Gypsum ...	" " ...	......	......	96% Cryst. $CaSO_4$	......	......	....
Sulphate of ammonia ...	Farmers' Fertilisers Corporation, Ltd., 31 Hunter-street.	20·4	24·8	......	......	......	15 12 10
Nitrate of soda ...	" " " ...	15·9	19·30	......	......	......	14 6 2
Nitrolim ...	" " " ...	18·0	21·85	......	......	......	14 0 6
Sulphate of potash ...	" " " ...	......	......	......	53 0	......	*
Gypsum ...	" " " ...	......	......	96% Cryst. $CaSO_4$	......	......	....

* No manurial value can be assigned to the Potash salts, owing to the fact that the usual source of supply is closed at present.

II.—Bone and Blood Manures.

Manure.	Where obtainable.	Guaranteed Composition. Nitrogen.	Equal to Ammonia.	Phosphoric Acid.	Equal to Tricalcic Phosphate.	Manurial Value. £ s. d.
Bone-dust	Geo. Shirley, Ltd., 18–22 Carrington-street ...	3·7	4·49	21·9	47·81	6 4 7
Bone and blood	" " " ...	5·5	6·68	17·0	37·11	6 18 6
Fish manure	Kitchen & Sons, Ltd., 365 Kent-street	5·5	6·68	12·0	26·20	6 3 6
Bone and blood	" " "	5 0	6·07	17·0	37·11	6 10 7
White bone-dust	" " "	3·5	4·25	25·0	54·58	6 10 8
Excelsior bone-dust	M. Gearin, Old Botany road, Mascot	3·71	4·5	21·98	48·0	6 5 0
C.W.S. fertiliser	Co-operative Wholesale Society, Ltd., Huntley-street, Alexandria.	5 5	6·68	17·0	37·11	6 18 6
Bone-dust	M. O'Riordan & Sons, O'Riordan st., Alexandria	3·71	4·5	21·98	48·0	6 5 0
Bone and blood	Silvester Bros., Regent-street, Redfern	3·95	4·8	18 3	42·18	5 17 9
Phosphatic bone-dust	Wooster Fertiliser Co., Alexandria	3·3	4·0	20·61	45·00	5 14 4
General purposes bone-dust ...	" " "	4·52	5·5	18·0	38·0	6 5 11
Pure steamed bone-dust	" " "	3·91	4·75	24·5	53·5	6 15 9
Raw or green bone-dust	" " "	4·01	4·86	24·41	53·30	6 17 0
Blood and bone	" " "	5·76	7·00	13·74	30·00	6 12 11
Bone-dust ***	R. S. Lamb & Co., Ltd., 32 Jamieson-street ..	4·12	5·00	22·9	50·0	6 14 3
" A1	" " "	4·12	5·00	19·24	42·0	6 3 4
Vulture	" " "	2·96	3 60	18·32	40·0	5 2 1
Blood and bone	" " "	4·74	5·75	17·40	38 0	6 7 8
Sandown bone and blood	John Cooke, Prop. Ltd., Sandown Freezing Works	6·85	8·32	10·44	22·82	7 0 4
Bone and blood	J. Barnes, Granville South	5·21	6·32	15·74	34·96	6 10 2
Bone-dust	" " "	4·43	5·38	20·74	45·28	6 12 8
Blood	B. Richards and Sons, Riverstone	13·43	16·28	....	... ...	10 3 9
Bone-dust	" "	3·17	3·85	26·78	58·51	6 10 10
Bone-dust, B.D.1	Paton, Burns, & Co., 75 York-street	3·7	4·5	22·12	48·29	6 5 3
" B.D.2	" " "	3·7	4·5	22·12	48·29	6 5 3
" B.D.3	" " "	3·3	4·0	20·7	45·19	5 14 7
" B.D.4	" " "	3·3	4·0	18·4	40·17	5 7 9
Blood and bone, B.B.1	" " "	5·7	6·92	18·0	39·3	7 4 9
Bone and blood	Farmers' Fertilisers Corp., Ltd., 31 Hunter-st. ...	4·91	5 96	18·0	39·3	6 12 2
Bone-dust	" " "	4·5	5·46	20·0	43·66	6 11 7

III.—Superphosphates, Mixed Fertilisers, and Imported Manures.

Manure.	Where obtainable.	Guaranteed Composition.				Manurial Value.
		Nitrogen.	Water soluble Phosphoric Acid.	Total Phosphoric Acid.	Potash.	£ s. d.
Superphosphate No. 1	George Shirley, Limited, 18–22 Carrington-street ..	....	17·0	....	....	4 5 0
,, No. 2	,, ,, ,, ...	1·6	15·0	....	1·0	
,, No. 3	,, ,, ,, ...	3·3	13·0	....	2·0	
,, No. 5	,, ,, ,, ...	3·3	12·0	....	7·0	*
,, No. 7	,, ,, ,, ...	1·6	11·4	....	1·0	*
,, No. 9	,, ,, ,, ..	4·1	6·5	....	4·0	*
,, No. 11	,, ,, ,, ...	....	11·4	....	7·0	*
,, No. 12	,, ,, ,, ...	3·3	5·5	14·6	2·0	*
,, No. 14	,, ,, ,, ...	2·5	5·5	14·2	6·0	*
,, No. 18	,, ,, ,, ..	....	5·5	14·2	6·0	*
,, No. 19	,, ,, ,, ...	4·1	4·1	11·4	2·0	*
,, A	,, ,, ,, ...	0·5	....	29·8	....	4 17 4
,, M	,, ,, ,, ...	1·6	....	16·0	1·0	*
,, N	,, ,, ,, ...	1·6	....	16·0	4·0	*
,, O	,, ,, ,, ...	2·5	....	13·7	6·0	*
Government P4 mixture... ..	,, ,, ,, ..	4·0	11·0	....	7·85	*
,, P5 ,, ...	,, ,, ,, ...	....	13·6	....	10·4	*
,, M5 ,, ...	,, ,, ,, ...	6·6	11·3	....	....	8 1 7
Sulphide Superphosphate ...	Gibbs, Bright, & Co., 37 Pitt stree	....	17·0	....	....	4 5 0
No. 1 Bone ,, ...	,, ,, ...	1·5	8·5	19·0	....	4 17 0
No. 2 ,, ,, ..	,, ,, ...	0·8	13·0	19·0	....	4 15 3
Nitro ,, ...	,, ,, ...	1·6	15·0	....	....	4 19 11
Potato manure	,, ,, ...	1·25	14·5	16·0	4·2	*
Orchard ,, ...	,, ,, ...	2·3	13·0	14·5	7·25	*

* No manuri value can be assigned to the potash salts in these mixture owing to the fact that the usual source of supply is closed at presen

III.—Superphosphates, Mixed Fertilisers, and Imported Manures—*continued.*

Manure.	Where obtainable.	Guaranteed Composition. Nitrogen.	Water soluble Phosphoric Acid.	Total Phosphoric Acid.	Potash.	Manurial Value. £ s. d.
Maize and fodder crop manure ...	Gibbs, Bright, & Co., 37 Pitt-street	3·0	11·0	14·0	1·0	*
Root crop manure	" "	3·25	7·5	10·0	4·75	*
Leguminous	" "	....	15·5	18·0	2·65	*
Special Potato Fertiliser ...	The Wooster Fertiliser Co., Alexandria	4·52	....	14·19	5·0	
Complete Fertiliser	" " "	5·01	....	14·56	2·0	*
Complete Mixed Manures, P.B.1	Paton, Burns, & Co., 75 York-street	4·3	4·25	9·75	5·0	*
" " P.B.2	" "	3·75	4·25	9·75	7·1	*
" " P.B.3	" "	3·4	5·1	9·0	7·1	
" " P.B.4	" "	3·3	2·75	9·65	7·1	*
" " P.B.5	" "	4·3	4·25	9·75	2·4	
" " P.B.6	" "	3·3	6·0	12·68	2·4	*
" " P.B.7	" "	1·7	6·8	13·47	1·2	
" " P.B.8	" "	0·82	8·5	10·8	7·1	*
" " P.B.9	" "	2·47	....	9·0	4·9	*
" " P.B.10	" "	2·47	....	10·5	4·9	*
" " P.B.11	" "	2·47	....	10·5	2·4	*
" " P.B.12	" "	1·6	....	14·9	0·6	
" " P.B.13	" "	....	....	12·0	7·1	*
Superphosphate	" "	....	17·0	....	....	4 5 0
Bone Phosphate	" "	....	....	29·77	....	4 9 4
Guano	" "	....	....	27·48	....	4 0 2
No. 1 Superphosphate	Farmers' Fertilisers Corporation, Ltd., 31 Hunter-st.	....	17·0	....	....	4 5 0
A1 "	" " " ...	....	20·0	....	....	5 0 0

* No manurial value can be assigned to the potash salts in these mixtures, owing to the fact that the usual source of supply is closed at present.

IV.—Waste-Products, Ashes, &c., not on the Market.

Manure.		Original Source.	Water.	Volatile and Combustible.	Nitrogen.	Ammonia.	Insoluble.	Lime.	Phosphoric Acid.	Potash.	Value. £ s. d.
Deposit from wool-scouring tanks.	1	Liverpool Wool-scouring Works.	....	....	·64	·73	....	....	....	·72	0 14 0
,,	2	,, ,, ,,	....	....	1·02	1·24	....	....	·16	·39	0 18 6
,,	3	,, ,, ,,	....	....	1·37	1·66	....	....	·14	·20	1 2 10
Deposit from breakers		,, ,, ,,	34·47		1·81	2·20	50·68	·85	·83	1·60	1 19 8
Sediment from wool-scouring works.		Yass	19·57		·59	·71	78·24	·97	....	·20	0 10 3
Scutch		Australian Glue-Gelatin Works, Alexandria.	56·98	....	2·95	3·58	....	4·56	None.	None.	2 6 0
,, from limed pelts		Hugh Wright, Auburn	5·32	73·42	1·80	2·18	3·61	9·36	·89	·20	1 11 8
Decomposed hair and lime		Fellmongery	9·70	57·08	6·86	8·33	1·22	26·27	....	....	5 7 0
Tan-yard refuse		Tanneries, St. Mary's	6·43	33·83	2·24	2·72	21·43	20·96	·67	....	1 16 10
Tan refuse		....	7·10	50·90	2·62	3·18	10·03	18·58	·56	·18	2 3 5
Fleshings from tannery		....	·91	75·37	4·43	5·38	5·98	....	1·14	·04	3 12 6
Salt (sweepings from tannery)		....	3·04	....	·70	·85	·38	....	....	....	0 10 11
Wool-waste		....	....	....	8·15	9·89	....	....	....	....	6 7 0
,,		....	34·33	23·20	1·97	2·39	26·03	2·75	·37	·32	1 13 6
Peat		H. Tager, Moss Vale	72·93	16·68	·35	·42	10·39 (ash).	....	....	....	0 5 5
,,		S. Cook, Pyrmont	49·51	34·63	·75	·91	....	....	·06	·01	0 11 11
Burnt peat		....	....	....	....	....	84·45	....	·25	·33	0 2 7
Filter-press muck		Cane-mills, Broadwater	16·39	26·07	·22	·27	34·86	13·20	5·95	·44	1 2 10
Megass		Clarence River cane	22·86	67·32	·63	·73	8·61	·30	·01	·05	0 10 1
Megass ash		,, ,,	....	....	....	....	87·69	3·07	·16	·51	0 3 4
,,		Richmond River cane	....	....	....	....	....	1·11	·21	4·79	1 7 4
Bloodwood ash		....	....	....	....	....	....	8·47	·27	5·25	1 10 0
Ironbark ash		....	....	....	....	....	....	....	·82	1·53	0 10 10
Blackbutt ash		....	....	....	....	....	....	7·27	·04	2·02	0 11 5
Red-gum ash		....	....	....	....	....	....	....	·33	4·17	1 4 4
Spotted-gum ash		....	....	....	....	....	....	....	·10	·70	0 3 11
Boxwood ash		....	....	....	....	....	....	....	·67	1·65	0 11 1
Grass-tree ash		....	·86	1·78	....	....	33·98	24·94	3·07	5·30	1 18 3
Vine-cuttings ash		....	·49	....	....	....	60·64	11·34	1·25	3·76	1 6 3
Red-apple ash		....	....	....	....	....	54·52	13·96	·47	6·09	1 14 10
She-oak ash		....	....	....	....	....	8·57	42·35	8·55	2·19	1 17 4
Hardwood ash		....	·50	1·35	....	....	62·28	13·50	1·76	3·04	1 1 6
Ash of wild melon		Stock Branch	....	....	....	....	....	5·12	4·85	27·08	8 4 11
Wood ashes		....	·30	....	....	....	21·43	41·37	·35	2·80	0 16 7
,,		Wentworth Irrigation Area.	....	....	....	....	11·12	50·73	·55	3·21	0 19 7
Ash of kerosene shale		Hartley Vale	1·49	27·93	·70	·85	67·59	....	·23	·14	0 12 6

NOTE.—In the above, potash has been valued on the 1914 unit for potash (K_2O in Sulphate of Potash), viz., 5s. 7d.

IV.—Waste-Products, Ashes, &c., not on the Market—*continued.*

Manure.	Original Source.	Water.	Volatile and Combustible.	Nitrogen.	Ammonia.	Insoluble.	Lime.	Phosphoric Acid.	Potash.	Value.
										£ s. d.
Clinker from locomotive boiler ..	....	....	....	....	....	....	....	....	·25	0 1 5
Residue from furnace	R. E. Bragg, Marrickville	1·55	35·63	·54	·61	52·40	·64	·43	·09	0 10 2
Sea-weed ash	....	....	....	....	....	....	9·27	·49	·59	0 4 8
"	....	....	....	....	....	....	6·29	1·27	17·55	5 1 7
"	....	·43	....	....	....	56·28	9·39	·47	2·26	0 13 6
"	Manly	....	....	....	....	43·06	6·52	·91	13·98	4 0 2
"	"	....	....	....	....	·07	·53	·19	34·30	9 11 11
"	Mr. Harvey, Department	3·25	19·46	....	....	61·63	4·22	·33	·22	0 2 2
Sea-weed, fresh state	....	80·00	....	·16	·19	....	·41	·09	1·18	0 9 4
Sea-weed	....	41·03	42·49	·14	·17	....	....	·21	·60	0 6 1
Sea-weed, dried	....	18·58	65·97	1·64	1·99	15·44 (ash).	3·44	·14	·14	1 6 9
Air-slacked lime	....	16·58	....	....	....	1·88	75·44	....	....	....
Residue from calcium carbide ..	....	41·36	....	....	....	1·03	36·19	....	....	....
Limestone rock	Queanbeyan ..	1·10	....	....	....	4·70	48·20	1·22	....	0 3 5
Agricultural lime	Portland Cement Co. ..	18·43	....	....	....	23·80	Hydrate 13·80 Carbonate 43·97	....	....	....
Gypsum	Marulan	(Crystallised $CaSO_4$=92·64)				4·47	....	....	....	....
Cave deposit, shells, &c.	Cowan, Hawkesbury River	2·11	....	·82	1·00	....	35·40	1·59	·88	1 2 2
" "	Macleay River	23·06	16·01	2·43	2·95	26·77	13·88	7·40	....	2 0 0
Deposit (coral, shell, &c.)	Pacific Islands	2·13	13·53	·72	·87	....	44·00	3·53	·39	1 3 5
Shells	Pambula River	....	....	....	....	....	44·59	·10	....	....
Flue deposit	Maitland	....	....	....	....	83·75	2·56	·32	·31	0 2 8
"	Liverpool	....	....	....	....	91·17	·42	1·29	·17	0 4 6
" from sanitary furnace	....	....	....	....	....	63·53	6·64	1·82	1·61	0 14 2
"	....	6·30	2·15	....	....	84·89	·32	·35	·38	0 3 2
Night-soil mixed with lime ..	....	41·33		·74	·89	18·60	7·62	·78	....	0 13 9
Night-soil	Wagga Wagga	6·70		·03	·04	82·19	·44	·23	·69	0 5 1
"	"	9·14		·28	·34	73·92	1·18	·18	·54	0 7 11
"	"	....		·50	·61	....	....	·64	·62	0 13 0
Night-soil preparation, No. 1 ..	....	8·22		3·73	4·63	50·22	13·32	9·65	·91	4 10 6
" " No. 2 ..	....	7·20		1·83	2·22	29·02	8·05	4·10	·15	2 1 0
" " No. 3 ..	....	25·95		1·64	1·99	60·17	1·39	1·61	·70	1 14 0
" preparation, "Pinhoe" manure.	....	·92	9·54	·21	·25	57·58	14·71	1·26	·56	0 10 0
Night-soil preparation	F. Artlett, Parramatta ..	7·33	30·06	2·10	2·55	46·38	2·09	1·92	·61	2 1 7
" "	" ..	10·11	42·59	4·97	6·03	·94	30·12	·39	....	3 18 7
" "	Mr. "Halstead," O'Brien's patent.	1·54	12·36	·54	·65	77·95	....	·63	....	0 10 5
" "	....	29·52	56·15	2·55	3·10	14·33 (ash)	....	....	....	1 19 9

NOTE.—In the above potash has been valued on the 1914 unit fo potash (K_2O in Sulphate of Potash), viz., 5s. 7d.

IV.—Waste-Products, Ashes, &c., not on the Market—*continued.*

Manure.	Original Source.	Water.	Volatile and Combustible.	Nitrogen.	Ammonia.	Insoluble.	Lime.	Phosphoric Acid.	Potash.	Value.
										£ s. d.
Farmyard manure	....	67·96	22·09	·40	·49	8·16	·16	·20	·30	0 8 5
Stable manure	Bathurst	39·26	....	·41	·50	....	....	·27	·67	0 10 11
Fowl manure	....	3·95	16·48	1·47	1·78	70·16	2·10	1·94	....	1 8 5
"	....	1·54	15·23	·86	1·04	79·96	·64	·59	·33	0 16 11
Sheep manure	Bathurst	7·73	....	1·06	1·30	....	....	·69	1·17	1 5 0
"	Liverpool Wool-scouring Works.	9·71	50·91	1·79	2·17	32·26	2·00	·91	·92	1 15 7
Sheep dag	....	....	....	3·04	3·69	....	....	....	....	2 7 4
Refuse manure	Abattoirs	12·00	74·51	4·14	5·03	6·56	....	1·80	....	3 9 7
Flying-fox manure	....	1·09	35·34	3·34	4·05	50·29	1·02	·36	1·15	2 19 6
Fish fertiliser	....	14·47	64·36	10·37	12·59	4·52	....	....	....	8 1 7
Shark fertiliser	....	9·02	68·04	10·59	12·85	3·86	....	7·27	....	9 5 7
Fish manure	....	10·88	59·26	6·10	7·40	5·39	9·82	8·28	....	5 18 6
Rabbit hair, long	Anderson, Oxford-street	8·73	88·64	14·03	17·04	3·63 (ash).	....	....	....	10 18 8
" short	" "	9·72	87·76	14·00	17·00	2·82 (ash).	....	....	....	10 18 0
Bat-guano	....	14·11	17·69	1·55	1·88	28·77	13·72	11·42	....	2 16 6
"	....	10·86	19·65	2·24	2·72	51·95	1·75	8·55	·15	2 5 10
"	....	13·70	34·35	4·76	5·78	3·30	22·28	13·04	trace.	5 11 1
Bat deposit	Cave Flat, Cooradigbee	5·43	12·98	·50	·61	57·64	5·60	12·12	....	2 2 1
Guano deposit	Tamworth	8·75	38·40	6·17	7·49	12·85	....	9·24	....	6 2 4
" "	"	8·42	20·97	3·10	3·76	31·89	....	7·87	....	3 10 7
" "	"	14·55	29·91	3·66	4·44	15·81	....	12·98	....	4 13 10
" "	"	9·35	44·32	6·73	8·17	7·33	....	13·17	....	7 2 2
Bone breccia	Queanbeyan	5·71	....	·59	·72	9·48	42·80	3·11	....	0 18 0
Muck from waterworks reservoir	Maitland	4·84	17·55	·74	·90	63·42	4·56	·31	·09	0 15 9
Muck raked from waterhole	....	63·66	29·86	·81	·98	3·80	·96	·10	·06	0 13 3
Sawdust	....	32·52	62·35	·82	1·00	....	....	1·70	·05	0 17 10
Decayed wood, bark and leaves, bloodwood.	....	57·80		·74	·89	40·68	1·30	....	....	0 11 6
Decayed wood, bark and leaves, pepper-tree.	....	79·02		·89	1·03	17·77	1·50	....	....	0 13 10
Coco-nut oil cake	....	8·24	....	3·29	3·99	....	....	1·20	1·49	3 3 0
Castor cake	....	13·81	74·08	4·30	5·22	....	....	1·83	·85	3 17 0
Pea cake	Java	16·02	....	7·24	8·79	....	....	1·46	1·17	6 3 6
Bean cake	North China	14·52	80·32	6·77	8·22	....	....	1·33	1·99	6 0 4
Rice husks	....	42·74	42·15	1·07	1·30	13·77	·02	·03	·04	0 17 0
Field pea, whole plant	....	88·58	9·97	·55	·67	....	·15	·12	·49	0 11 8
Tares, whole plant	....	83·97	14·96	·73	·88	....	....	·11	·21	0 12 10
Marsh mallow, whole plant	....	79·00	17·86	·85	1·03	....	....	·14	·60	0 17 6
Horse bean, leaves and stalks	....	82·87	15·90	·90	1·09	....	·05	·11	·54	0 17 4

NOTE.—In the above, potash has been valued on the 1914 unit for potash (K_2O in Sulphate of Potash), viz., 5s. 7d.

The Hymenomycetes of New South Wales.

[Continued from Vol. XXV, page 1048.]

J. B. CLELAND, M.D., Principal Microbiologist, Department of Health, and
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3. *Lepiota.*

"PILEUS regular, usually scaly, due to the presence of the concrete universal veil and the breaking up of the cuticle; gills free, often very remote from the stem and attached to a cartilaginous collar; stem central, its substance distinct from the flesh of the pileus; ring at first continuous with the cuticle of the pileus, often movable, sometimes soon disappearing; volva absent.

"The present genus differs from *Amanita* and *Amanitopsis* in the absence of a volva, and from every other genus in the Leucosporeæ in the free gills.

"In many species, but not in all, the flesh of the stem is of a different texture to that of the pileus, and its apex terminates in a socket-like depression of the flesh of the pileus, a peculiarity clearly evident in a vertical section through pileus and stem. The remains of the universal veil are thoroughly connate with the cuticle of the pileus, and not in the form of removable warts or flakes as in *Amanita* and *Amanitopsis.*

"ANALYSIS OF THE SPECIES.

"A.—Cuticle dry.

"I.—*Proceri.* Ring movable.

"When young the fungus is entirely enclosed in the universal veil, which splits in a circumscissile manner, the basal portion not distinct from the bulb, the upper portion being concrete with the cuticle of the pileus, which is usually scaly. Stem not peronate or sheathed with stocking-like continuation of the veil, as in the following section; apex of stem with a cartilaginous ring, to which the free, remote gills are attached.

"II.—*Clypeolarii.* Ring fixed, homogeneous with the universal veil that sheathes the stem; stem floccose or squamulose with the universal veil up to the ring; cartilaginous collar at the apex close to the stem, hence the gills are usually not so remote. Flesh soft, smell and taste unpleasant, somewhat resembling radishes.

"III.—*Annulosi.* Ring superior, fixed, somewhat persistent; universal veil adnate with the pileus. Collar at apex of stem absent, or similar in texture to the flesh of the stem.

"IV.—*Granulosi.* Universal veil at first contiguous with pileus and stem, and when ruptured forms the inferior ring. Pileus granular or warted. The stem is not so distinctly differentiated from the pileus as in the other sections.

"V.—*Mesomorphi.* Small, slender, stem fistulose; pileus dry, cuticle entire. Not granular or torn, as in the section *Clypeolarii.*

"B.—Cuticle of pileus viscid; not at all broken up."—Massee, *Brit. Fung. Flora.*

The species of this genus have the gills quite free from the stem, as in the closely-allied genera *Amanita* and *Amanitopsis*, but they differ from these two genera in having no superficial or removable warts on the pileus, and no sheathing or scaly remains of a wrapper, which is known as a volva, at the base of the stem. In some species the epidermis or cuticle of the cap breaks into scales which persistently adhere to the cap, and this feature suggested the name of the genus.

Another feature by which the species of *Lepiota* may be distinguished from *Amanita* is, according to Mr. W. Treleuse,* "that the gills of *Amanita* remain white as the specimens age or when heated, while in the smooth *Lepiota* they turn to a light brown as the plants grow stale or when they are cooked."

Some of the species of *Lepiota* are edible, including the "Parasol Lepiota" (*L. procera*) and the "Onion-like Lepiota" (*L. cepæstipes*), both of which are to be found in the neighbourhood of Sydney. There are a very large number of species of this genus known to science, thirty-one of which are recorded as having been found in Australia, and of this number eight have been recorded for this State. Most of the species grow on the ground, but some are found on tan-bark, usually in green-houses, or on sawdust, and occasionally near stumps, while a few are also found on dung.

A.—CUTICLE DRY.

I.—PROCERI.

9.—*Lepiota procera*, Scop.

Massee, *Brit. Fungus Flora*, iii, p. 234.
Agaricus procerus, Scop., *Carn.*, p. 418.
Fries, *Hymenomyc Europ.*, 29.
Cooke, *Illustrs.*, t. 221.
Cooke, *Handb. Aust. Fungi*, No. 16.

Pileus 4–9 in. across, flesh rather thick, very soft and cottony, tough, permanently white; cylindrical ovate at first, then campanulate, finally expanded; umbo prominent, broad and obtuse; cuticle brown, becoming broken up into broad, flat, thick scales, interstices whitish; gills terminating behind in a broad, plano-depressed, cartilaginous collar that carries them away from the stem, crowded, ventricose, broadest in front, soft, whitish, edge sometimes brownish; stem 5–8 in. long, ½ in. thick, base swollen, the remainder cylindrical, firm, somewhat cartilaginous, variegated with adpressed brown scales, apex inserted into a deep socket in the flesh of the pileus; internal cavity distinct, at first stuffed with delicate fibrils; ring ample, persistent, becoming free, and slipping down to the base of the stem; spores elliptical, 12–15 x 8–9 μ.

Pileus 3–7 in. broad, at first obtusely conic, at length campanulate, strongly umbonate fleshy, epidermis velvety, red-brown, broken with subreflexed scales, the whole resembling brown shaggy leather; margin white or pinkish, silky; flesh soft cottony, except in the

* Rept. Mo. Bot. Gard., vol. 15, p. 84.

centre when young. Gills perfectly free, separated by a considerable space from the point of insertion of the stripes, ventricose, margin serrated, pale pinkish yellow or white. Spores white elliptic. Stem 8–12 in. high, ½ in. thick, attenuated upwards, sunk deep into the flesh of the pileus as into a socket, very bulbous, scaly, hollow, but stuffed w th a cottony web. Ring coriaceous, thick and spongy, convex below movable. Taste and smell pleasant. (Berk.) —Massee.

Some authors give spore measurements up to nearly 18 x 10 μ.

Cooke (No. 16) records this edible species for Victoria, New South Wales, Queensland, and Tasmania. It is known as the "Parasol Mushroom" from its shape and the movable ring on the stem, and is usually found in open pastures.

In Europe it is regarded as a fine edible species, and the following method of preparing it is recommended:—Remove the stalk and scales and broil over a clear fire for a few minutes, and then arrange them on a dish over fresh-made toast, sprinkle with pepper and salt, and put a small piece of butter on each, and melt the butter, and serve up quickly.

10.—*Lepiota rachodes*, Vittad.

Agaricus rachodes, Vittadinsi, *Fung. Mang.*, p. 158, t. 20.
Fries, *Hym. Europ.*, 29.
Cooke, *Handbook of Brit. Fungi*, p. 11.
Cooke, *Illustr.*, pl. 22.
Lepiota procera, var. *rachodes*, Massee, *Brit. Fung. Flora*, Vol. III, p. 234.

Pileus fleshy, soft, at first globose, then expanded and depressed, 18–10 cm. broad; *cuticle thin, broken into persistent scales*, stem hollow, attenuated, smooth, immaculate, bulb at first abrupt (10 cm. or more long, scarcely 1 cm. thick); ring lacerated, movable; gills remote. Spores 10 x 6 μ. In shady pastures. Esculent. Victoria. —Cooke.

Under *L. procera*, var. *rachodes*, Massee (*Brit. Fungus Flora*) says:—"Habit, and about same size as the typical form; differing more especially in the stem, being quite even and not at all squamulose; flesh of pileus thicker, white, but becoming more or less evidently tinged with red when broken.

The same author, in his *British Fungi and Lichens*, states that *L. rachodes* differs from *L. procera* in not being umbonate. Cooke (*Handbook of Aust. Fungi*) apparently lays stress on the thick cuticle, torn up into broad evanescent scales, of *L. procera*.

This species we have definitely met with once, at Bibbenluke, Southern N.S.W., in March, 1913. The pileus was 4½ in. in diameter, when young elongated globular to hemispherical, white, with large scale-like brownish flakes; gills free, crowded, white; stem up to 6 in., 1 in. broad above, 1½ in. below, base swollen, hollow, rooting mycelial fibrils below, ring prominent, flesh of the stem turning reddish-brown when cut. In young specimens the pileus was pale brown and cracking. Spores irregularly oval, apiculate, 11·7 to 13·5 x 6·3 to 8 μ. Amongst grass in an orchard. The spores are larger than the measurements given by Cooke.

11.—*Lepiota excoriata*, Schaeff.

Agaricus excoriatus, Schaeffer, t. 18, 19.
Cooke, *Handbook of Brit. Fungi*, p. 12.
Cooke, *Illustrs.*, pl. 23.
Cooke, *Handb. of Aust. Fungi*, No. 18.
Massee, *Brit. Fung. Flora*, p. 235.

Pileus 2–3 in. across, flesh rather thick, white, soft, unchangeable; globose, then expanded, at length flattened, more gibbous than umbonate, sometimes altogether whitish, disc sometimes brownish, cuticle very thin, sometimes even and persistently silky, sometimes broken up into scales, more or less peeling off towards the margin; gills free,

but not distant from the stem, soft, white; stem about 3 in. long, 4–5 lines thick, quite equal or very slightly bulbous, hollow, even, almost plain [illegible], very distant from the flesh of the pileus, white; spores 11–15 x 8–9 [illegible].

Pileus 2½ in. across, expanded, often a little irregular, [illegible] umbonate, flesh spongy; epidermis cracked into small areolae, silky between the areolae, [illegible], on the margin pale fawn, the umbo dark. Gills ventricose, free, so as to leave a broad space round the top of the stem, which is sunk into the substance of the pileus, [illegible] white, slightly watery, imbricate when old; sometimes much broader on one side than on the opposite side of the pileus, and sometimes stained with claret-coloured blotches, spores white, elliptic, with an evident transparent border; stem 1½–2 in. high, [illegible] in. thick, attenuated regularly upwards without a decided bulb, minutely fibrillose, hollow, but stuffed with a beautiful cottony web, ring deflexed, movable, but not so free as that of *A. procerus*. (Berk.) —Massee.

Cooke records this esculent species for Victoria, New South Wales, Queensland, and Western Australia in pastures.

12.—*Lepiota gracilenta*, Kromb.

Agaricus gracilentus, Krombholz, t. 24, figs. 13, 14.
Lepiota gracilenta, Cooke, *Handbook of Brit. Fungi*, p. 12; Illustr., pl. 23.
Massee, *Brit. Fung. Flora*, Vol. III, p. 235.

Pileus 2–3 in. across, flesh rather thick at the disc; campanulate, then expanded, obtusely umbonate, brownish when quite young, whitish when expanded, and spotted with the adpressed, broken up patches of the brown cuticle; gills free, remote from the stem, very broad, pallid; stem 5–6 in. long, 3–5 lines thick, more or less bulbous at the base, whitish, hollow; ring thin, floccose, disappearing. In pastures, also in woods.

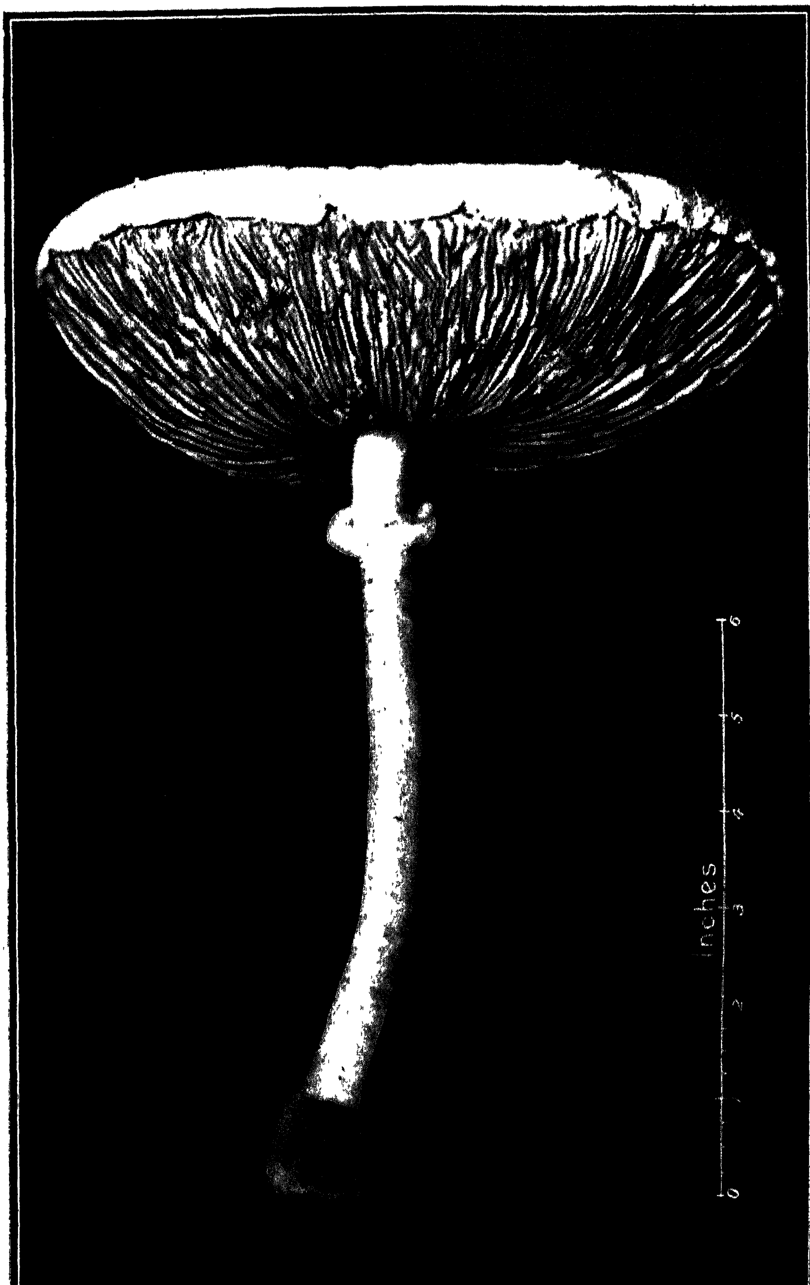
Resembling *L. procera*, but more delicate. Stem 5–6 in. long, 4–5 lines thick, obsoletely scaly. Pileus at first ovate, then campanulate, and at length flattened, spotted with brownish scales. (W. G. Smith). —Massee.

A Lepiote, which agrees in general with the above description and with a figure of *L. gracilenta* in Massee's *British Fungi and Lichens*, was found by one of us (J.B.C.) at Terrigal, north of Sydney, on the ground in a wood—June, 1914. The stem was solid and not hollow, however: the spores also were very large, but we have no written record of the size of those of *L. gracilenta* with which to compare them. Our specimen may therefore be perhaps new, but we place it here provisionally. Its description is as follows:—Pileus 3 in. in diameter, almost plane, umbonate, fawny brownish, dark adpressed scales near the umbo, becoming more fibrous near the edge. Gills widely free, attached to a disc, moderately crowded, becoming discoloured. Stem 6 in., attenuated upwards, base stout, solid, silky pallid, fibrously streaked. Ring not recognisable (? disappeared). Spores oval, 13·8 to 15·5 x 10·4 μ, occasionally 19 x 12 μ. The specimens taken in the following localities also seem referable to this species:—Sydney district, April to June; Lilyvale and Scarborough (A. A. Hamilton), April and May.

13.—*Lepiota dolichaula*, B. and Br.

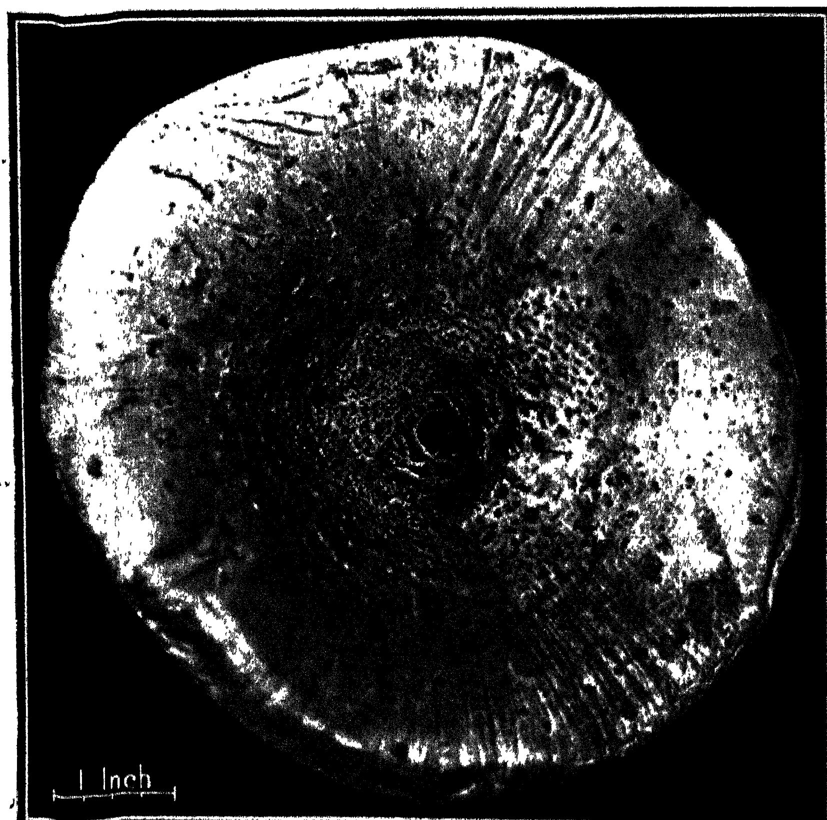
Agaricus (Lepiota) dolichaulus, Berkeley and Broome, *Linn. Trans.* xxvii, p. 150.
Cooke, *Handbook of Aust. Fungi*, No. 20.
Grevillea, xviii, pl. 177.
Lepiota dolichaula, Petch, *Anns. Roy. Bot. Gdns.*, Peradeniya, Vol. iv, pt. 2 (1907).
Cheel, *Proc. Linn. Soc. N.S.W.* xxxii (1907), p. 202.
Cheel, *Agri. Gaz. N.S.W.* (1909), p. 1059.
Cheel, *Ann. Rep. Bot. Gdns.*, Sydney, 1909, 1910, 1912.

Pileus fleshy, expanded, umbonate, centre smooth, otherwise pannately squamulose, margin torn and appendiculate, flesh white, unchangeable; stem elongated, straight, nearly equal, except at the base where it is bulbous; apex penetrating, flocculosely punctate, hollow, ring broad, deflexed and torn; gills broad, ventricose, very remote. Spores [illegible] x 7 μ. On the ground, Queensland. Cooke.



Lepiota dolichaula. **Side view of old specimen with upturned cap.**

THE HYMENOMYCETES OF NEW SOUTH WALES.



Lepiota dolichaula. **Top view of cap.**

Specimens of this species are believed to have poisoned cattle on the Tweed River, N.S.W.

THE HYMENOMYCETES OF NEW SOUTH WALES.

The above is a translation of the original description, with the addition of spore measurements. The latter, it will be seen later on, do not agree with those of Ceylon specimens taken by Petch.

The pileus is almost plain, except for the well-defined umbo and the decurved margin. The umbo is pale or dark brown, minutely tomentose; elsewhere the pileus is white, covered with minute, brown, widely separated, dot-like warts; between the warts it is thickly covered with minute, white granules, or almost glabrous. It varies from 11 19 cm. in diameter, and the white, loose flesh is about 1·5 cm. thick near the centre. The margin is appendiculate and decurved, but only half covers the ends of the gills. The gills are ventricose, up to 2·5 cm. wide, rounded or truncate at the outer ends, which are widely exposed, free, somewhat distant. They turn yellow in drying, and are pinkish when eaten by insects. The stem is 29 - 12 cm. long, about 1·5 cm. in diameter, attenuated upwards, with a well-defined bulb 2·3 cm. in diameter, at the base; white, mealy or glabrous, sunk into the pileus for about a centimetre, hollow, lined with shining white fibres brittle; the inner layers are pinkish, and when the outer layer is split the stem shows pinkish spots and streaks. The ring is about one-fifth the height from the top. It is movable, with a sheathing collar about 5 mm. deep, joined below to a free rigid horizontal portion about 5 mm. wide, which passes into a looser, ample, dependent certain. It is sealy beneath. The spores are white, oval, thick-walled, 12-17 x 8-10 μ. —Petch.

As this species was originally described from Ceylon, and Petch says it is fairly common there on lawns, his spore measurements must be considered as correct for the typical form. As he seems to infer that *Lepiota altissima*, Mass., from India, with spores 8 x 5 μ, is also this species, perhaps the size of the spores varies considerably and Cooke's figures (10 x 6-7 μ) also belong to the same species. A Lepiote referred by one of us to Massee some while back and gathered in Sydney, and which was identified as *L. dolichaula*, had spores apiculate, obliquely oval, 8·5 to 10·4 x 7 μ, but these spores were not thick-walled, as in other specimens in our collection, and it seems certain that two species have here been confused. Our other specimens, from various localities, agree with Petch's description, and with the plate in *Grevillea*. Cooke's spore measurements puzzled us, as the spores of our specimens were 10·4 to 15·5 x 8·5 to 10·7 μ, and we felt inclined to refer them therefore to a variant of *L. procera*, but Petch's paper and the figure in *Grevillea* seem to settle their authenticity. Some of the specimens collected on the Tweed River, N.S.W., 1909, are believed to have poisoned cattle which were seen eating them. This is interesting in view of Petch's statement, in which he says there is some doubt as to whether the species is edible, more especially as the natives say they do not eat it.

In November, 1901, this species was gathered in Centennial Park, Sydney. In 1909 specimens were collected in the Tweed River district which were suspected of being poisonous to stock. A further collection was communicated to one of us by Mr. Marcus H. Blaxland, of Mirambeek, Tweed River, who gives the following particulars concerning it:—"I may remark that again this year I have had a heifer ill with eating fungus, and found that the linseed oil, as recommended by Mr. Max Henry, M.R.C.V.S., gave relief quicker than the Epsom salts in the quantities last year, and consider it undoubtedly saved the life of the heifer." We have also specimens collected at Ermington (Miss M. Flockton), March, 1912; Sydney district, January and February; Brownsville, near Dapto, April, 1912. In view of these possible poisonous qualities, this species must be carefully distinguished

from the edible *L. procera*, which it resembles. The pale cap, with its scattered minute dot like scales, help to distinguish it in the field from the darker and more scaly *L. procera*. Nevertheless, the utmost circumspection must be exercised in eating what appears to be the latter species.

The accompanying illustration will indicate the general appearance of this species.

14. *Lepiota lepidophorus*, Berk. and Br.

Agaricus (*Lepiota*) *lepidophorus*, Berkeley and Broome, *Ceylon Fungi*, p. 498.
Saccardo, *Syll.*, *No.* 170.
Cooke, *Handbook of Aust. Fungi*, No. 21.

Pileus campanulate, papillately umbonate, then plane (2½–3 cm. broad), rather fleshy, obtuse, white, sprinkled with minute reddish scales, stem attenuated upwards (4 cm long, 2 cm. thick), stuffed, ring movable; gills ventricose, approximating to the stem, lemon-yellow spores 8 μ long. On the ground, New South Wales. Cooke.

Specimens are recorded as having been found in the Botanic Gardens, Sydney, in May, 1907, and June, 1908.

II.—Clypeolarii.

15.—*Lepiota beckleri*, Berk.

Agaricus (*Lepiota*) *beckleri*, Berkeley, *Journ. Linn. Soc.* (*Bot.*), xiii, p. 156.
Grevillea, xix, pl. 179, fig. A.
Cooke, *Handbook Aust. Fungi*, No. 25.

Pileus subglobose or campanulate, umbonate, spongy, tomentose, rough about the apex, with little scales; stem long, very minutely warted, becoming smooth, equal, with a tuberous root, ring broad, deflexed, gills broad, ventricose, attenuated behind. Spores 14 x 8 μ, sometimes 16 x 10 μ. On the ground in scorched places. N.S.W. Cooke.

We have not found this species.

16.—*Lepiota citrophylla*, Berk. and Broome.

Agaricus (*Lepiota*) *citrophyllus*, Berkeley and Broome, *Linn. Journ.*, Vol. xi, p. 509.
Cooke, *Handbook of Brit. Fungi*, p. 362.
Cooke, *Illustrs.*, pl. 639.
Lepiota citrophylla, Massee, *Brit. Fung. Flora*, Vol. iii, p. 244.

Pileus up to ⅞ in. across, flesh thin; convex, then expanded, obtuse or broadly umbonate, at length depressed, lemon-yellow, clad with rugous scales; gills free or slightly adnexed, rounded behind or attenuated, lemon-yellow; stem 1–1½ in. long, 1½ lines thick, equal, squamulose, lemon-yellow, stuffed, then hollow; ring almost obsolete; spores elliptical, 7·8 x 8 μ. On the ground. Somewhat resembling *L. amianthina*, but distinguished by the free or only very slightly adnexed gills and the white flesh. —Massee.

Under *L. cepaestipes* we refer to an Agaric that we have provisionally placed under this species. It was obtained at Sydney, April, 1914. It was pale yellow, gills and stem included, had a slightly scaly cap, a distant ring, and spores measuring 7 x 3 μ. It turned a dark green where bruised. Lepiotes, with spores 7 to 7·5 x 4·2 μ, collected by Miss M. Flockton at Gladesville in February, 1911, are also perhaps this species.

III.—Annulosi.

17.—*Lepiota holosericea*, Fr.

Agaricus (*Lepiota*) *holosericeus*, Fries, *Epicr.*, p. 16.
Cooke, *Handbook of Brit. Fungi*, p. 15.
Cooke, *Illustrs.* pl. 41.
Lepiota holosericea, Massee, *Brit. Fung. Flora*, Vol. iii, p. 245.

Pileus 3–4 in. across, flesh thick, soft, white; convex, then expanded and almost plane, obtuse, silkily floccose and somewhat fibrillose, even, fragile, whitish or with a tinge of tan colour, disc not at all gibbous and coloured like the remainder, margin incurved when

young; gills quite free, broad, ventricose, crowded, pallid white; stem solid, 2½-4 in. long, ½ in. and more thick, soft, fragile, silkily fibrillose, whitish, base bulbous, not rooting; ring superior, membranaceous, large, soft, pendulous, margin turned up; spores elliptical, 7-8 x 5 μ. In gardens. Large, inodorous, very soft. —Massee.

We have specimens, probably of this species, from a country district in New South Wales, taken in 1913. The spores measured 6·8 to (occasionally) 9·7 x 5·8 to 6·8 μ.

18.—*Lepiota naucina*, Fries.

Agaricus (Lepiota) naucinus, Fries, *Epicr.*, p. 163.
Cooke, *Handbook of Brit. Fungi*, p. 15.
Cooke, *Illustrs.*, pl. 15.
Massee, *Brit. Fung. Flora*, Vol. iii, p. 246.
Cooke, *Handbook of Aust. Fungi*, No. 31.
Cheel, *Ann. Rep. Bot. Gdns.*, Sydney (1911).

White. Pileus 2-4 in. across, flesh thick, soft; spherical, then expanded and almost plane, somewhat umbonate and smooth at the centre, cuticle thin, glabrous then breaking up into evanescent granules; gills free but very close to the stem, 2-3 lines broad, narrow in front; stem 2 in. long, ¼ in. thick at the apex, becoming thicker downwards to the swollen base, imperfectly hollow; ring superior, thin, delicate, usually soon disappearing; spores subglobose, 6-7 μ diameter. In fields, cucumber frames, &c., somewhat cæspitose. Resembling *L. excoriata* in general appearance, but differing in the superior, thin ring, &c. In Cooke's figure the pileus is slightly depressed at the disc, and no indication of an umbo. —Massee.

"In fields, Victoria. Var. *sphærosporus*, Cooke and Mass., *Grev.*, xviii, 5. Spore globose, 10-12 μ. On the ground, Queensland."—Cooke.

We have a single collection of this species from Leura (T. Steel), February, 1911. Its description is as follows:—Cap medium, 5-10 cm. wide, wholly white or somewhat buff, smooth, or rarely with tiny scales, spherical to bell-shaped, then convex or expanded; stem rather stout, 5-12 cm. by 7-15 mm., white, more or less covered with fibres, enlarged below, stuffed, then somewhat hollow; gills free, white, then pink when old, crowded; spores oval, 8-10 x 5-8 μ. The species is reported among the best of the edible mushrooms; it resembles the common mushroom (*Psalliota campestris*), but is readily distinguished by the fact that the white gills become pink only when the plant is mature or old.

19.—*Lepiota cepæstipes*, Sow.

Agaricus cepæstipes, Sowerby, *Fungi*, t. 2.
Cooke, *Handbook of Brit. Fungi*, p. 15
Cooke, *Illustrs.*, pl. 5, also p. 942 (var. *cretacea*, Bulliard).
Cooke, *Handbook of Austr. Fungi*, No. 37.
Petch, *Anns. of Royal Bot. Gdns.*, Peradeniya.

Pileus 1-3 in. across, flesh thin; ovate then expanded, disc fleshy and broadly umbonate, mealy and squamose with evanescent plumose scales, pale sulphur-yellow or white, disc often brownish, margin plicate; gills free, at length distant from the stem, 1-2 lines broad, rather distant, whitish or with a yellow tinge; stem 3-6 in. high, 1½ lines thick at the apex, swollen often very considerably at the middle or near the base, floccose, white or pale yellow, hollow; ring distant; spores elliptical, 7-8 x 4 μ; on tan in hothouses, melon beds, &c.

Gregarious or tufted. Whole plant white, pale sulphur colour or yellow. Pileus 1-3 in. broad, ovate-conical when young, then campanulate, and finally plane or nearly plane, darker in the centre, and more or less covered with small scattered fibrous scales, the flesh thin, and vanishing entirely towards the margin, which is plicate and semi-transparent; the substance is, however, tough, and bears folding between the fingers without laceration. Lamellæ numerous, thin, in no regular series, the extremities next the stipes broad and rounded, and separated from it by a circular space. Stipes 3-6 in.

high, straight or crooked, firm, even, smooth, narrow at the [illegible], but [illegible] below, then narrowed again at the very bottom, somewhat [illegible], the [illegible] with delicate silky fibres, at length hollow; annulus perfect, [illegible] persistent [illegible] white, copious, elliptical.

In decay the pileus turns brownish and, according to [illegible], the [illegible] becomes covered with little globules of fluid, and gradually [illegible]

Petch describes Ceylon specimens as follows:—

Gregarious, sometimes connate at the base. Pileus at first ovate, [illegible] flat, then conico-campanulate, finally plane, sometimes slightly umbonate, up to [illegible] cm. in diameter; centre brown or deep yellow, with a few small warts or scales, elsewhere pale yellow with a few small brown-tipped scales towards the centre, mealy or floccose [illegible] the [illegible]; strongly plicato-sulcate almost to the centre; flesh thin; [illegible] membranaceous. Stalk up to 6 cm. high, strongly inflated below, contracted at the base, attenuated [illegible] suddenly at about half the height, up to 1·2 cm. diameter near the base, and [illegible] at the apex, pale-yellow, powdered with minute yellow granules or flocci, with a few brown scales at the base; solid below, hollow above; flesh yellow, interior of cavity white; base truncate. Ring white or yellow, fragile, free, evanescent. Gills pale yellow, [illegible] not crowded, free, interstices veined. Spores white, broadly oval or subglobose, [illegible] 7 x [illegible] μ. On footpaths, in flower-beds, &c., often in dense clusters with large numbers of [illegible] examples springing up close to the bases of the expanded specimens; the mycelium consists of rather thick white rooting threads. Young specimens are [illegible] shaped, the diameter of the flat topped ovate pileus being approximately equal to that of the inflated base.

We have met with four yellow-coloured Lepiota-like agarics in the neighbourhood of Sydney, as well as another which turned greenish on decay. One of these is certainly *Lepiota (Hiatula) licmophora* (spores 11 to 12·5 x 7 to 8·5 μ). Another may be *L. citrophylla* (spores 7 x 3 μ), under which we refer to. Of the other two, both, though obviously different species, would pass for the descriptions of *L. cepaestipes*. In one, however, the spores are 6 to 7 x 4·5 to 5 μ and in the other 7 to 10·1 and even 12 x 5·2 to 7 μ. The former of these we therefore consider to be *L. cepaestipes*.

This agaric came up in clusters in a garden in Sydney in June. The caps were under 1 inch in diameter, of a beautiful pale yellow colour, mealy, striate, and with a brownish tinted umbo. The finely floccose pale yellow stems were only a little over an inch high.

Cooke records the species for Queensland, our record being new for New South Wales.

20.—*Lepiota licmophora*, B. and Br. (*Hiatula licmophora*, Petch).

Agaricus (Lepiota) licmophorus, Berkeley and Broome, *Linn. Journ.* xi, 50.
Cooke, *Handbook of Aust. Fungi*, No. 36.
Massee, *Brit. Fungus Flora.*
Hiatula licmophora, Petch, *Anns. of Roy. Bot. Gdns.*, Peradeniya.

Pileus 2·5 to 3 cm. diameter, plane, or repand, radially plicate-sulcate almost to the centre, which consists of a slightly convex disc 3 to 5 mm. diameter; disc pale-brown or greenish-yellow, smooth; crests of the ridges clothed with sulphur-yellow or greenish-yellow flocci; between the ridges, hyaline, somewhat transversely wrinkled; flesh none, except in the central disc. Stalk 6 to 9 cm. high, attenuated upwards, about 2 mm. diameter at the base, 1 mm. diameter at the apex, very pale greenish-yellow with a few flocci or white and almost glabrous, sunk into the central disc, hollow, white internally; ring about two-thirds the length of the stalk from the base, small, evanescent, yellowish. Gills white, transparent, narrow, equal, nearly all reaching and attached to the central yellow disc surrounding the apex of the stalk. Spores broadly oval, with an obtuse papilla at the distal end, and an apical apiculus at the other, thus appearing biapiculate, or rather limoniform, white 11–13 x 7–8 μ. —Petch.

We have met with this fungus in one locality in Sydney during two seasons. The description of these specimens which follows will show an

entire agreement with that given by Petch. The description in Massee will not hold for the Ceylon species, which is the true *L. licmophora*, and Petch points out inaccuracies in Cooke's illustrations. The fungus is recorded by Cooke for Victoria. We have provisionally left this species in the genus *Lepiota*, with the more delicate species of which it has so much in common. Our specimens shrivel up on handling, but do not truly deliquesce and dried plants can easily be obtained.

Description.—Pileus almost membranaceous. Convexo-plane. 1 inch in diameter. Disc fleshy, not umbonate, pure yellow to yellow-umber, ¼ inch diameter. The rest of the pileus is membranaceous. It is powdered round the disc with fine canary-yellow shining grains. The rest of the pileus is ribbed, the crest of the ribs being similarly powdered whilst the depressions are whitish or pale cream. The gills are white, moderately distant, each alternate one being short. They end at the solid disc, $\frac{1}{16}$ inch from the stem. The stem is 4 inches high, and is gradually attenuated upwards from $\frac{3}{16}$ inch to $\frac{1}{16}$ inch. It is hollow and powdered with fine yellow grains, which rub off on the finger. As the *Lepiota* fades, it collapses and becomes sticky. Spores oval, colourless, with a large central vacuole, pointed at both ends, the point at one end being laterally displaced. Size 12 to 12·5 x 8·5 μ. (Plate II, Fig. 4, December, 1914. On the plate itself, the figures 3 and 4 have been transposed.) Met with on several occasions in one situation amongst leaves under trees at Cremorne, Sydney, in April, 1913 and 1914.

(*To be continued.*)

Seed Testing for Farmers.

The Department is prepared to test vegetable and farm crop seeds. Reports will be given stating the germination capabilities of the seed, its purity, and the nature of the impurities, if any.

Communications should be addressed to the Director, Botanic Gardens, Sydney. Not less than 1 ounce of small seeds such as lucerne, or 2 ounces of large seeds like peas, should be sent. Larger quantities are to be preferred. Seeds should be accompanied by any information available as to origin, where purchased, age, &c.

If a purity report only is desired, it should be so stated, to secure a prompt reply. Germination tests take from six to twenty days, according to the seed.

Insectivorous Birds of New South Wales.

[Continued from page 217.]

WALTER W. FROGGATT, F.L.S., Government Entomologist.

No. 51. The Bee Eater (*Merops ornatus*).

THIS handsome little bird belongs to an interesting family, not related to any of our other birds, but allied to the Oriental Hoopoos remarkable for their crown of upright feathers. The members of the family, *Meropidæ*, range over Southern Europe, Africa, and Asia, and the distinctive group to which our species belongs (*Merops*) contains seventeen species distinguished from the other bee birds, in having the two central tail feathers elongated.

Our bee eater is found all over Australia, frequenting open forest country and the timber along river banks and creeks. It can be easily distinguished from other birds when at rest, or on the wing, by its slender black bill, delicate green plumage, with orange and black markings upon the head and throat, and the projecting central tail feathers, very conspicuous when flying. Usually perching upon the outstretched dead branch of a gum tree or a telegraph line (if one is handy), it sits on guard, ready to pounce down and snap up any insect flying past its post of observation, so that though some writers have specified particular groups of insects as its food, nothing hardly ever comes amiss in the insect line, and its food is as varied as the insects of the district.

Once when the writer was insect-hunting on the summit of Mount Marmion, in North-west Australia, he aroused the interest of a pair of bee eaters, who followed him round, and whenever he disturbed a butterfly or moth from the undergrowth, and missed it with his net, it was snapped up by the knowing bee birds.

The nesting habits of the bee birds are peculiar, for they make regular tunnels, with openings no bigger than a mouse hole, into the steep river banks. These tunnels are about a yard in length, and open out into little pockets, in which are laid four or five pinkish white eggs.

As an active insectivorous bird, and often in sufficient numbers to make an effective onslaught upon many of our common insect pests, the bee bird may be placed in a prominent place in our list.

There is, however, another side to the activities of the bee birds, for as its name implies this bird is very fond of honey bees, and in districts where honey bees are kept, the bee bird is not looked upon as a welcome visitor.

In the Tamworth district the bee-keepers look upon the bee birds as a nuisance, if not a pest, and claim that it is very destructive to the honey-bees, catching them when coming home to the hive. It is, however, when the work of breeding queen bees is being carried out that this bird does the most serious damage. The Apiarist at the Hawkesbury Agricultural College

Slightly less than half-size.

INSECTIVOROUS BIRDS OF NEW SOUTH WALES.

"THE AUSTRALIAN BEE-EATER."

Merops ornatus.

informed the writer that the losses due to the bee eaters there are sometimes very serious. The critical time is when, after mating, the young queen hovers round flying in a circle several times as if taking her bearings, before turning for home; but a bee bird that learns these habits soon meets with its just dues, and the trouble is over for the time.

Showing, however, how things tend to right themselves, there was an account in a Victorian newspaper last year, stating that the bee keepers had welcomed the advent of a flock of bee eaters into their district, because they had destroyed the large dragon flies, which had previously been hawking over their bee hives. Now, both the dragon flies and robber flies (also bee killers), under normal conditions are among our most useful friendly insects, destroying noxious insects, such as mosquitoes and other pest flies; yet this time, they in turn were pests to the bee-keepers.

No. 52. The Masked Wood Swallow (*Artamus personatus*).

The earlier naturalists considered that the wood swallows were related to the thrushes, and Latham called our commonest species the "Sordid Thrush." Jerdon, studying the Indian forms, characterised them as "Swallow Shrikes," but the popular name adopted by Gould of "Wood Swallows," seems to define them much more sharply to the bush naturalist. In Victoria several species were grouped under the name of "Summer Birds," because, migratory in their habits, they used to appear in large numbers to nest in the low gum-tree scrub about Bendigo in that State, towards the middle of November and December, winging their way northward before the advent of winter. In New South Wales they are sometimes called Martins.

The home of the members of the genus *Artamus* is India, the Malay Archipelago, the Pacific Islands, and Australia. Nine species are found in the last-named country, some of which remain on the continent all the year round; but others, crossing from New Guinea, are migratory, returning northward at the fall of the year. The Masked Wood Swallow is recorded from all parts of Australia except in the far West and the Northern Territory, usually nesting in October in New South Wales.

The nest is a very poorly constructed affair, chiefly composed of grass, loosely woven together, stuck in the fork of a branch, with hardly any attempt at concealment. As the Wood Swallows used to be among the last birds to nest in Victoria, it was not an uncommon thing to find them adapting the abandoned nest of some other bird for their requirements; and on the Murray frontages they often used the old mud nests of the Magpie Larks, simply filling them up with a little dead grass or other suitable material. In these nests they deposit a clutch of two or three white eggs spotted and splashed with brown.

The Masked Wood Swallows are very active birds; usually going about in comparatively small flocks compared with some of the other species, flying in and out among the trees with the flight of a swallow, and the squeaky chirp of a sparrow.

At night when roosting on a bare branch, they have a curious habit, like that of some of the Finches, of resting in a row, the black throats and light coloured breasts forming a marked contrast in the bunch.

Two other species might be noticed here which, though distinct in coloration, are identical in their habits.

The common flock Wood Swallow (*Artamus sordidus*), about the size of a sparrow, has the whole of the body grey, with the wings and tail dark bluish black. They are found all over Australia and across the Straits into Tasmania during the summer months. The White-eyebrowed Wood Swallow (*Artamus superciliosus*) is the most elegant in form and coloration of all the family. It was figured in the Insectivorous Birds of New South Wales as No. 27 of the Series in the March number of the *Gazette*, 1912.

The head is marked with black, with a deep white stripe above the eyes, the breast blackish grey, with the under surface of the body rich chestnut brown, wings and tail grey. Though so distinctive in coloration, naturalists consider that these last two species are closely allied, often flying together, and nesting in the same trees, and there are several authentic records of them mating together.

As insectivorous birds the Wood Swallows play an important part on the open plains and scattered forest land in destroying cutworms, other plague caterpillars, and grasshoppers. A flock of a thousand or more sometimes congregate over a swarm of young grasshoppers or cutworms, and devour the whole of them before they have had time to do any serious damage to the grass or crops.

At times bee-keepers complain that the Wood Swallows are finding out that the domestic honey bees are good food and easily caught, and it can be easily understood how much damage can be done by the advent of a flock of Wood Swallows among the slow-flying honey bees. But if a few have to be shot before they can be induced to move on, their usefulness much outweighs the disadvantage of this bad habit.

Formula for the Measurement of Logs.

A correspondent recently asked for a ready method of calculating the superficial contents of any mill log.

In reply, the Director of Forests supplied the following:—Take the mean girth of a log in inches, divide by 4, and square it; multiply this result by the length of the log in feet, and the result will be the contents of the log in superficial feet.

Example:—Mean girth = 80 inches.
Length of log = 30 feet.

$$\frac{\left(\frac{80}{4}\right)^2 \times 30}{12} = 1{,}000 \text{ superficial feet.}$$

Slightly less than half-size.

INSECTIVOROUS BIRDS OF NEW SOUTH WALES.

"THE MASKED WOOD-SWALLOW."

Artamus personatus.

Planning the Poultry Farm.

A Suggested Design.

JAMES HADLINGTON, Poultry Expert.

FOLLOWING the trend of modern thought and practice, poultry-keeping is becoming more and more specialized as a pursuit. The time when the general farmer kept large numbers of poultry as an adjunct to his many activities is passing away, and specialization in poultry as a business is in the ascendancy. This, if it is to be successful, calls for systemization to a much larger extent than has hitherto obtained. True, there are some poultry farms arranged on systematic lines, but, as must be obvious even to the casual observer, the bulk of poultry farms are a jumble of buildings that have been erected at various times with a total absence of any concerted plan or system.

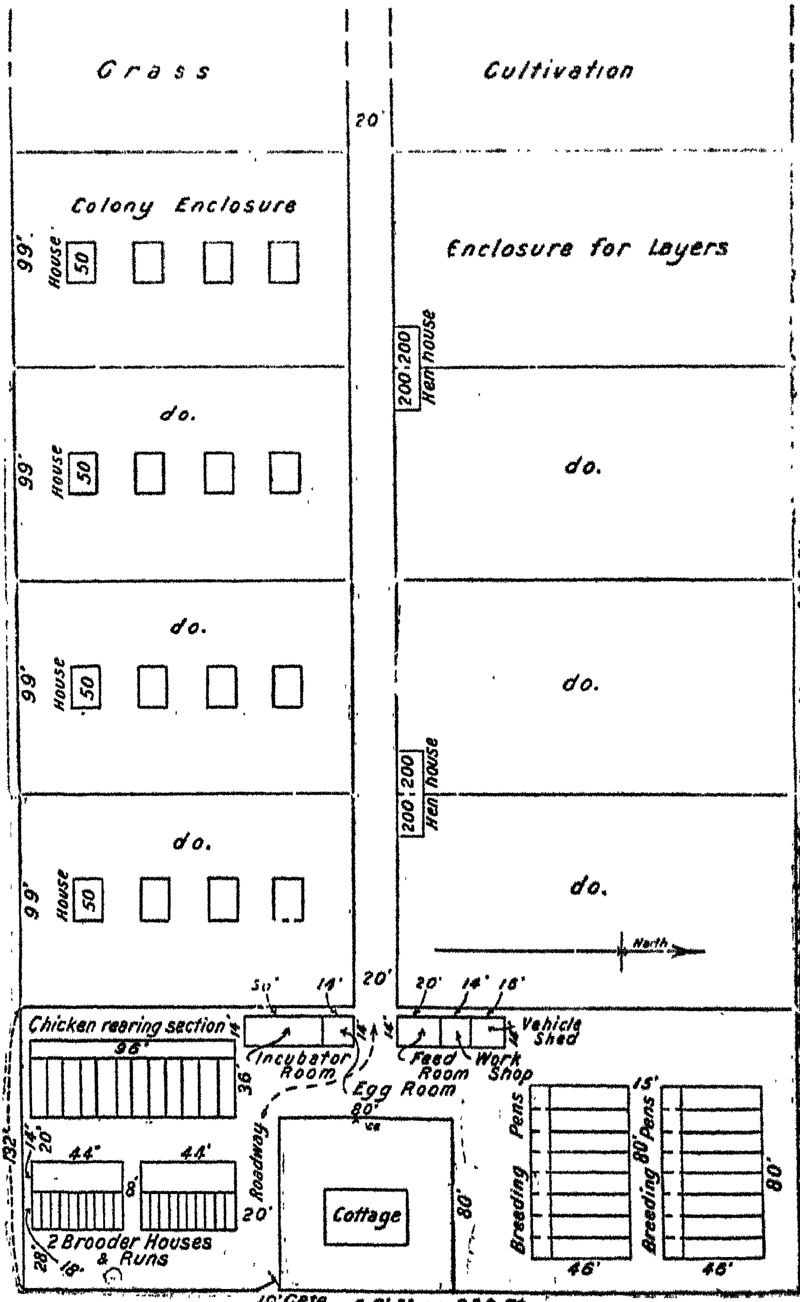
This feature, together with the many applications for assistance in regard to the planning of poultry farms, has induced me to draw out the accompanying ground plan of a poultry farm, which, while it is quite understood, may not be applicable in its entirety to all locations and contours of land, will nevertheless be found suggestive in its main features in connection with most conditions. It is hoped that it will materially assist any who may be contemplating the laying out of a poultry farm to arrange their plant in such a manner as will eliminate many of the troubles, and much of the drudgery, incidental to poultry-keeping on old-time lines.

The Plan Explained.

The plan is based on the presumption of 5 acres of land, laid out as a poultry farm, with positions for residence, and all the principal buildings. Allowance is made for half an acre of cultivation for the purpose of growing green feed, and half an acre for grass or other uses. The farm is designed to have a carrying capacity of from 800 to 1,000 layers, together with accommodation for rearing sufficient chickens to replace them as required. One of the main features of the plan is the complete separation of the rearing plant, equipment, and runs from the accommodation for the adult stock. This is most desirable, and, in fact, essential for the successful and economical working of the farm.

The residence, as shown in the plan, should be completely fenced in with 6 feet wire-netting of a strong gauge, preferably what is known as 72 x 2 x 16, so that the house and garden can be secure from the intrusion of stray poultry.

The most important of the farm buildings and equipment are situated in close proximity to the residence. This will facilitate the economical working of these portions of the plant, insomuch as the distance to be



Grass
Cultivation
20'
Colony Enclosure
Enclosure for Layers
99'
House
50
200:200
Hen house
do.
do.
do.
do.
do.
North
20'
Chicken rearing section
96'
36'
Incubator Room
Egg Room
Feed Room
Work Shop
Vehicle Shed
14'
20'
44'
44'
2 Brooder Houses & Runs
Roadway
80'
Cottage
Breeding Pens
15'
46'
46'
10' Gate
5 Ch. or 330 Ft.
10 Chns or 660 Ft.
132'

traversed is the least where the most constant attention is necessary, such as to brooder-house, incubator-house, breeding sections, &c. The advantages of this arrangement will be obvious to those who have had experience in the hatching and rearing of chickens. In this connection it will be noted that the plan provides that the whole of the rearing equipment, including the colony rearing grounds, is all on one side of the plan, while the feeding-room, workshop, cart-shed, breeding-pens, and laying enclosure. are all situate on the other side. I hold that this arrangement is most essential for the health and well-being of growing stock.

By adopting this system of completely separating the rearing department from that of the adult fowl-runs, less trouble is likely to arise from vermin, which are more or less a permanent feature among adult stock. This separation decreases the probability of the infestation of the young stock. Another important feature of this division is that it allows for a complete resting of the rearing grounds of the farm during the portion of the year when not in use. This in itself is a great advantage, and is conductive to successful rearing.

In regard to the whole plan, it is quite understood that a poultry farm is usually a matter of growth from small beginnings, but the adoption of this plan at the commencement allows of a progressive development of the farm on the lines laid down, even if only a portion is erected at a time, or if smaller enclosures are adopted than those provided for in the scheme.

The Treatment of Weevily Seed.

The question was recently asked whether some seed wheat that had become infected with weevil could be treated so as to be useful for seed, and whether it would be safe afterwards to store seed unaffected by weevil 100 yards away.

Mr. W. W. Froggatt, Government Entomologist, replied that the seed could be treated with bi-sulphide of carbon, 5 lb. to 100 bushels. The wheat should be turned out of the bags on to a smooth floor, and the fluid bi-sulphide of carbon placed in a dish in the centre of the heap, where the fumes could spread out through the grain. The heap of wheat should be covered with tarpaulins and left for twenty-four hours (not more), and then spread out before being re-bagged. Where there are free weevils through the grain, it is advisable to run the wheat through a winnower and blow out the damaged grain and weevils. If the barn is clean and well built, and the wheat is in good bags, it should not be re-infected in a barn 100 yards away.

It is probable that the treated wheat may be fit to use for seed, but before making a definite statement on that point, the Department would have to examine a sample of the infested grain.

Poultry Notes.

JAMES HADLINGTON, Poultry Expert.

April.

The breeding season will soon be with us, and, therefore, now is the time to think about the quantity and quality of the stock to be raised next spring. I have previously remarked that the time to make dispositions to ensure good, strong, rearable chickens is some months before the eggs are laid. To this end the breeding stock should be selected and penned before the winter sets in, because, as mentioned in previous notes, the less the stock is disturbed at this time the better from a laying point of view. Another advantage is that when the birds are properly penned they can receive better attention, and be brought into good condition before their eggs are required for setting. As indicated in last month's notes, the egg yield, even under favourable conditions, can only be expected to be seasonable, which means, for the winter, on a low scale, and the result is that, even under good management, it is difficult to get sufficient eggs from the breeding pens to start the incubators or setting hens, as the case may be, and to maintain a constant supply before August. This is especially the case when hens in their second year are being relied upon as breeders, and it will take all the skill and attention of the attendant to ensure these laying sufficiently early.

Incubating Period.

There would seem to be some misunderstanding among beginners in regard to the proper time at which it is advisable to commence to set eggs. It has been stated in previous notes that the best time to start hatching out the heavier breeds is from July on, and the lighter breeds, such as Leghorns, a month later; but there has been a tendency to confuse the time as recommended for hatching with the time for putting down the eggs, which is a different matter, and should obviously be calculated as three weeks back from the time stated for hatching. To put the matter more explicitly, eggs of the heavier breeds, such as Orpingtons, Wyandottes, Plymouth Rocks, Rhode Island Reds, and Langshans, should commence to be set from 1st June; while for the eggs of the lighter breeds, such as Leghorns, the first week in July will be early enough. It is advisable that the eggs should be fertile two or three weeks previous to the time stated for setting; in other words, to get an early start in hatching, eggs should be ready to set during the last two weeks in May for the heavier breeds, and a month later for the lighter breeds. It is suggested that at this time a trial run of the incubator be made to test the fertility of the eggs.

It will thus be seen that active preparation should be made for the breeding season a very considerable time before the time stated for hatching, and if these early preparations are not made the best part of the season for rearing is lost, and the operator finds himself hatching late chickens to catch up to the quantity he wishes to secure.

The Fear of Hatching too Early.

One of the greatest deterrents to getting an early start with hatching is the fact that the early-hatched pullets are likely to break into a moult. This fear is well grounded in regard to Leghorns and Mediterranean breeds generally, but, where a considerable number of chickens have to be hatched, the question arises as to whether it is not better to have a certain number of early-hatched pullets, even though they break up, than to have the same number of late-hatched ones? The latter would be perspective poor layers in any case without the development and stamina of the former. There is this, too, in regard to the early-hatched ones that with favourable development these pullets should come on to lay about January. The prospects are that they would lay for a couple or three months, after which many may go into moult, and be some considerable time before they come on to lay again, but there is a counterbalancing feature in the cockerels hatched at the same time—that they bring considerably higher prices than is the case with those hatched right in the middle of the season, and still more so than the very late ones. Then, too, the early-hatched pullets, even though perhaps they have not laid so many eggs as those hatched at exactly the right time, should be strong, well-grown hens fit to use as breeders the following spring; therefore, they would not be quite the unprofitable factors they are generally supposed to be. Those hatched at the end of the season are less profitable on all counts—as layers, as table poultry, greater percentage of losses, and slower development, which means feed and attention for a longer period to obtain even less weight. These are factors of importance to keep in view when making one's dispositions for the breeding season.

Flock *v.* Competition Results.

Comments are often made that competition results are not obtainable with the average farm flock. That this is the case is unfortunately true; but when we come to examine the factors operating in both cases, it will be obvious that under present practices they are not likely to be obtained, for the following reason:—The age limit imposed in the competitions is such that very late pullets are excluded. The wisdom of this has often been questioned, but it has been based upon the experience in regard to the right time to hatch layers of most of the prominent breeders who have from time to time served on the committee. This in itself points only in one direction, and that is an affirmation of the season experience has marked out as the best time to hatch layers, and the success of poultry rearing is so much dependent upon a proper appreciation of this fact as to constitute one of the main factors in success or failure.

It is not possible to lay down a rule suitable to all conditions and environments as to when the best layers are hatched—breed, strain, and general conditions are all factors to be reckoned with—but it is fairly safe to set down a general rule applicable to most conditions that from 1st July to the middle of September is the best for heavier breeds, and from 1st August to the end of September for the lighter breeds. But taking a perspective view of the hatching season as a whole, and as practised on most farms, probably not more than one-third of the stock are hatched during that period; therefore, the other two-thirds constitute less profitable factors, particularly in regard to laying. They are, therefore, not comparable with the bulk of birds competing in laying competitions, which are for the most part hatched within the prescribed period and well cared for prior to entering upon the year's work.

The lessons to be learned from these facts are that the poultry-keeper who keeps steadily in view what is here emphasised in regard to early preparations for the hatching season, selection of and attention to the breeding stock, both individually and collectively, and also to the installation of good plant and equipment for turning out the most chickens during this brief period, is likely to be the most successful as a breeder of layers, with fewer losses and better development in rearing his stock.

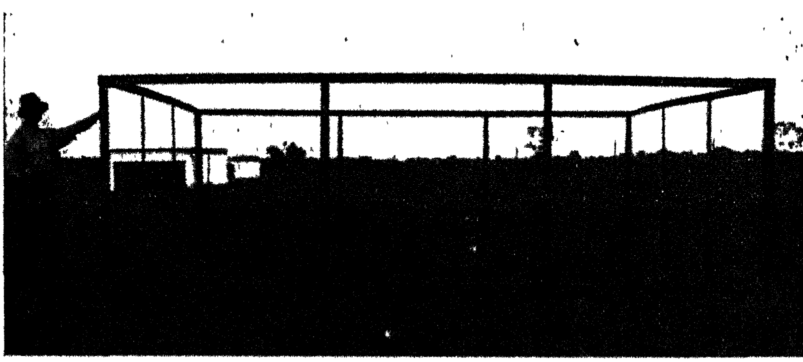
At the present time the outlook for poultry-keepers is not bright owing to dear food, but a proper appreciation of all the factors that go to make up success in the business will minimise losses and assist in tiding over a most trying period.

Portable Enclosures for Poultry.

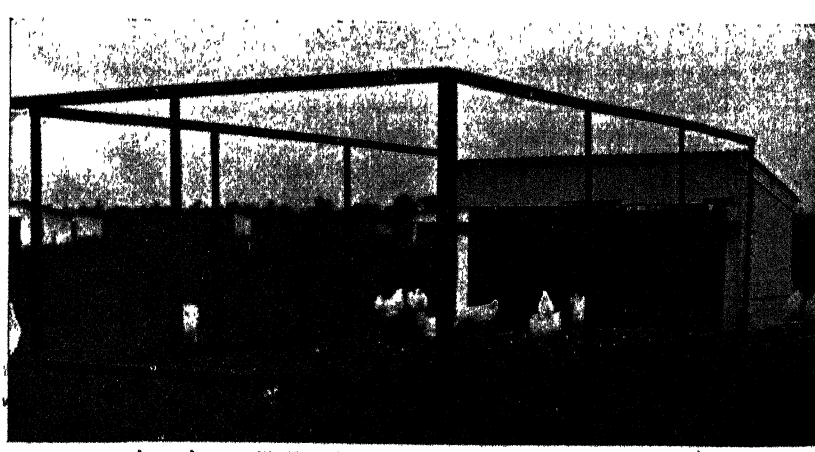
When dealing with "The Construction of Poultry Buildings" in the February issue, reference was made to the use of portable enclosures. These are fully illustrated on the accompanying page, and require very little further description.

The frames are constructed of 3 x 1 Oregon battens, with the exception of the one for the bottom, which is of hardwood. The frames are 18 feet long by 6 feet 4 inches wide, with bars at 6 feet intervals, and covered with 72 x 2 x 18 wire netting, though 19 gauge may be used. The cost, apart from labour, is about 4s. 9d. each.—J. Hadlington.

A single frame.



An enclosure with four frames.



An enclosure with three frames and the house used as a fourth side.

PORTABLE ENCLOSURES FOR POULTRY.

Agricultural Bureau of New South Wales.

NOTES COMPILED BY H. ROSS, Chief Inspector.

Branch.	Honorary Secretary.
Albury	Mr. J. Brenn, "Silvania," Racecourse Road, Albury.
Baan Baa	Mr. P. Gilbert, Baan Baa.
Balldale	Mr. H. Elrington, Balldale.
Bathurst	Mr. J. McIntyre, Orton Park.
Batlow	Mr. A. C. Arnst, Batlow.
Beckom	Mr. Peter Grant, Beckom.
Blacktown	Mr. Robert H. Lalor, P.O., Seven Hills.
Bloom Hill (O'Connell) ...	Mr. C. A. McAlister, Bloom Hill, O'Connell.
Borambil	Mr. H. A. D. Crossman, "Homewood," Quirindi.
Bungalong	Mr. G. H. Pereira, "Springdale," Cowra Road, *viâ* Cowra.
Canadian	Mr. F. W. Taylor, Public School, Canadian Lead.
Cardiff	Mr. John Cockburn, Cardiff.
Carlingford	Mr. D. K. Otton, Carlingford.
Cattai	Mr. A. J. McDonald, Cattai, Pitt Town.
Collie	Mr. C. J. Rowcliff.
Coonabarabran	Mr. H. H. Moss, Coonabarabran.
Coradgery	Mr. J. Clatworthy, Beechmore, Millpose, Parkes
Coraki	Mr. G. E. Ardill, Bungawalbyn.
Coreen-Burraja	Mr. N. B. Alston, Coreen, *viâ* Corowa.
Courangra	Mr. S. H. Warland, Courangra, *viâ* Brooklyn.
Cowra	Mr. E. P. Todhunter, Cowra.
Crudine	Mr. F. W. Clarke, Crudine.
Cundletown	Mr. S. A. Levick, Roseneath, Cundletown.
Cundumbul and Eurimbla	Mr. J. D. Berney, Eurimbla, *viâ* Cumnock.
Deniliquin	Mr. W. J. Adams, jun., Deniliquin.
Derrain	Mr. A. P. Hunter, Red Bank Creek, Matong
Dubbo	Mr. T. A. Nicholas, Dubbo.
Dunedoo	Mr. V. A. Florance (*pro tem*), Dunedoo.
Erudgere	Mr. Frank Hughes, Erudgere.
Fairfield West	Mr. J. H. Spargo, Hamilton Road, Fairfield.
Fernbrook	Mr. W. Marks, Yarrum Creek, Dorrigo.
Forest Creek	Mr. W. Thompson, Forest Creek, Frogmore.
Garra and Pinecliff ...	Mr. A. S. Blackwood, "Netherton," Garra, *viâ* Pinecliff.
Gerringong	Mr. J. Miller, Gerringong.
Grenfell	Mr. G. Cousins, Grenfell.
Gunning	Mr. E. H. Turner, Gunning.
Henty	Mr. L. Eulenstein (*pro tem*), Henty.
Hillston	Mr. M. Knechtli, Hillston.
Inverell	Mr. W. A. Kook, Rock Mount, Inverell.
Jerrara	Mr. A. O. Lane, Public School, Mullengrove, Wheeo.
Jindabyne	Mr. Sylvester Kennedy, Jindabyne.
Katoomba	Mr. C. Wooller, Oliva Park Farm, Katoomba.
Keepit, Manilla	Mr. J. B. Fitzgerald, Keepit, *viâ* Manilla.
Kellyville	Mr. Joseph Nutter, Kellyville.
Kenthurst	Mr. J. R. Jones, Kenthurst.
Lankey's Creek (Jingellic)	Mr. G. J. Nichols, P.O., Jingellic.
Leech's Gully	Mr. J. F. Weir, Tenterfield.
Leeton	Mr. C. Ledwidge, Farm 442, Leeton.
Little Plain	Mr. F. S. Stening, Little Plain, *viâ* Inverell.
Lower Portland	Mr. W. C. Gambrill, Lower Portland.
Mangrove Mountain ...	Mr. G. T. Hunt, Mangrove Mountain, *viâ* Gosford.
Martin's Creek	Mr. P. Laney, Martin's Creek, *viâ* Paterson.
Meadow Flat	Mr. F. J. Brown, "The Poplars," Meadow Flat, *viâ* Rydal
Middle Dural	Mr. A. E. Best, "Ellicsleigh," Middle Dural.
Milbrulong	Mr. O. Ludwig, Milbrulong.
Miller's Forest	Mr. A. J. O'Brien, Miller's Forest.
Mittagong	Mr. W. S. Cooke, "Fernmount," P.O., Alpine.
Moruya	Mr. P. Flynn, Moruya.
Narellan	Mr. G. J. Richardson, Narellan.

Branch.	Honorary Secretary.
Narrandera	Mr. James Falkner, Narrandera.
Nelson's Plains	Mr. M. Cunningham, Nelson's Plains
New Italy	Mr. F. A. Morandini, New Italy.
Nimbin	Mr. J. T. Hutchinson, Nimbin.
Orangeville	Mr. C. Duck, Orangeville, The Oaks
Orchard Hills (Penrith) ...	Mr. H. Basedow, Orchard Hills, *via* Penrith.
Parkesbourne	Mr. W. H. Weatherstone, Parkesbourne.
Peak Hill	Mr. A. B. Pettigrew, Peak Hill.
Penrose-Kareela	Mr. A. J. Bennett, "Brookvale," Kareela.
Ponto	Mr. A. D. Dunkley, Ponto.
Redbank	Mr. J. J. Cunningham, Redbank, Laggan.
Ringwood	Mr. Wm. Tait, Ringwood.
Robert's Creek	Mr. J. Cavanagh, Robert's Creek.
St. Mary's	Mr. W. Morris, Queen and Victoria Streets, St. Mary's.
Sackville	Mr. Arthur Manning, Sackville.
Sherwood	Mr. J. E. Davis, Sherwood.
Stockinbingal	Mr. J. Neville, Stockinbingal.
St. John's Park	Mr. J. O. Scott, St. John's Park.
Tallawang	Mr. G. Lincoln, junior, Tallawang.
Taralga	Mr. Dave Mullaney, Stonequarry, Taralga.
Tatham	Mr. J. J. Riley, Tatham.
Temora	Mr. J. T. Warren, "Mortlake," Victoria-street, Temora.
Toronto	Mr. J. G. Desreaux, Esmond, Toronto.
Tumbarumba	Mr. R. Livingstone, Tumbarumba.
United Peel River (Woolomin).	Mr. C. J. MacRae, Woolomin.
Upper Belmore River ...	Mr. A. W. Fowler, Upper Belmore River, *via* Gladstone, Macleay River.
Uralla	Mr. E. A. Neil, Uralla.
Valla	Mr. A. E. T. Reynolds, Valla, *via* Bowraville.
Wagga	Mr. Thos. Fraser, Aberfeldie, Wagga.
Walla Walla	Mr. H. Smith, Walla Walla.
Wallendbeen	Mr. W. J. Cartwright, Wallendbeen.
Walli	Mr. Geo. Edgerton, Applewood, Walli.
Wetherill Park	Mr. L. Rainbow, Wetherill Park.
Wollun	Mr. Robert Turner, Wollun.
Wolseley Park	Mr. H. McEachern, Wolseley Park.
Wyan	Mr. C. W. Harper, Myrtle Creek Railway Station.
Wyong	Mr. Edgar J. Johns, Wyong.
Yass	———
Yetholme	Mr. N. D. Graham, "Bona Dea," Yetholme.
Yurrunga and Avoca ...	Mr. W. H. Waters, Yurrunga.

Notice to Honorary Secretaries.

It is important that a record of the meetings of the branches should be inserted in the *Agricultural Gazette*, and honorary secretaries are invited to forward to the Department a short account of the proceedings of each meeting, with a brief summary of any paper which may have been read, and the discussion that followed it, as early as possible after each meeting. Notes for insertion in the *Agricultural Gazette* must reach the Department before the 16th to ensure insertion in the following month's issue.

Insect Pests.—Quite a number of the branches have availed themselves of the Department's offer to supply a set of insects, being the common pests of the district, and the collections are now being cased. The Government Entomologist suggests that as each district has certain pests peculiar to its orchards and gardens, more useful work would be done if the members themselves collected the local pests (orchard, garden, and stock) and sent them to the Department, where they would be arranged, mounted, a descriptive label attached, and returned to the branch. Mr. Froggatt considers that such a collection would have a far greater value, as there would be more

interest attached to the specimens when the members knew exactly where the pests came from, and where and how to find them.

Organisation of Branches.

An officer (Mr. A. M. Makinson) has been appointed especially to attend to the needs and wants of branches of the Agricultural Bureau, and generally to organise this movement.

He will visit in turn every branch throughout the State, and confer with the Secretaries and members as to future operations, &c.

Secretaries will be advised in due course when this officer will pay a visit to their respective districts.

Demonstrations in Clearing Land and Subsoiling with Explosives

A limited number of demonstrations in clearing land and subsoiling with explosives will be given by Mr. C. W. Burrows, Assistant Inspector of Agriculture, to branches of the Agricultural Bureau. Branches who wish to take advantage of this offer are requested to make early application to the Department through their honorary secretaries.

Veterinary Lectures.

In connection with the lectures to branches of the Agricultural Bureau, it is herewith pointed out for the information of honorary secretaries that the following is the list of subjects of lectures which can be delivered to them:—

Horses.—(1) Conformation and Unsoundness (with lantern illustrations); (2) Colic and Treatment of Wounds; (3) Strangles, Influenza, and Tetanus.

Cattle.—(1) Tuberculosis (with lantern illustrations); (2) Contagious Abortion and Contagious Mammitis; (3) Ticks, Tick Fever, Tick Infestation and Eradication.

Sheep.—Parasitic Diseases of Sheep.

Pigs.—Diseases of Pigs.

General.—(1) Parturition of Farm Animals (with lantern illustrations); (2) Feeding of Farm Animals and Dietetic Diseases; (3) Sterility: Causes and Treatment in all classes of Stock.

Bee-keeping.

A series of lectures on bee-keeping is being arranged by Mr. R. G. Warry, Instructor in Apiculture. Secretaries, whose branches intend availing themselves of this opportunity to receive a practical insight into this branch of agriculture, are requested to make early application.

REPORTS AND NOTICES FROM BRANCHES.

Bloom Hill (O'Connell).

A new branch was formed at Bloom Hill, O'Connell, on 27th February, with twenty-five members to commence.

The following are the office-bearers:—Chairman, Mr. Alfred Bailey; Vice-Chairman, Mr. W. H. Bailey; Hon. Secretary and Treasurer, Mr. C. A. McAlister.

The subscription fee was fixed at 2s. 6d. per annum, and meetings are to be held regularly in the local public school.

Papers for discussion at the next meeting were promised by Mr. F. Tatlow, on "Treatment of Ailments of Horses (Strangles, Colic)"; by Mr. Wm. Downey, on "Fruit-growing"; and by Mr. J. Spicer, on "Wheat Culture."

Canadian.

The monthly meeting of this branch was held on 27th February, when a paper, from which the following extracts are taken, was read by Mr. F. W. Taylor:—

Rotation of Crops.

The theory of rotation of crops is based on such considerations as the following:—Plants differ much in the habit of growth, and in the proportion of the different elements which they draw from the soil. Deep-rooted plants have a beneficial effect on the physical condition of the soil, and are capable of obtaining food and moisture from the subsoil at comparatively great depths; while shallow-rooted plants do not enter the subsoil to such an extent, and are, therefore, more dependent on the surface soil. To the least observant, the rotation of crops in nature itself must be patent; therefore, why not under cultivation where it is more imperative? The reasons were stated under the following headings:—

1. The influence of rotation upon plant food.—It prevents exhaustion of the soil, because different plants require different elements. It prevents loss by exposure, as the sun and oxygen of the air assist in setting free too much nitrogen, and rain washes away some.

2. It renders plant food available.—Some plants, as Timothy grass, absorb food at a rapid rate, so it is necessary to rotate in their case. By rotating a legume with wheat—one a deep-rooted and the other a shallow-rooted plant—the lower and upper soils are fed upon alternately. Fertilising is rendered easier. Too much flag or scant leaves is due to excess of or want of nitrogen in the soil. Rotation also affects the enemies of plants. The soil should be ploughed when weeds are about to grow, and an affected crop (either insect or fungoid) should not be grown the second year.

3. Profit in rotation.—The most profitable crop in rotation is the first to be considered. It should not be repeatedly grown, but such a rotation chosen as will best suit the ground.

4. Selecting the course in rotation.—A farmer should consider what can be successfully grown and what can be successfully used or sold. These principles lie entirely with the farmer's facilities for keeping and feeding stock, and the markets.

In a secondary sense rotation of crops makes better farms and better men, and the successive cropping provides for the better distribution of labour throughout the year. The paper concluded with seven suggested courses in rotation.

The Chairman in moving a vote of thanks to the reader, asked those who were willing to make an effort to go in for rotation, even if on a small scale for a start, and to note the results. Most of the farmers present said that rotation in this district seemed to be out of the question, at least during the summer months.

Collie

The annual meeting of this branch was held on 27th February, when the following officers were elected:—Chairman, Mr. C. W. Brown; Vice-Chairmen, Messrs. F. O'Conner and J. L. Mitchell; Hon. Secretary, Mr. C. J. Rowcliff.

The report and balance-sheet showed that during the year nine business meetings were held, and fairly well attended.

Cundumbul and Eurimbla.

A meeting of the above branch was held at Eurimbla on the 1st March. There was a good attendance of members, and Mr. F. T. Meurant occupied the chair.

An endeavour is to be made to have a wheat experiment plot established in the locality.

On the whole, the progress of the branch is entirely satisfactory, and if members continue their interest much good will result.

Henty.

The usual monthly meeting was held on 6th March, when there was a fair attendance. Mr. R. O. Eulenstein promised to read a paper on the pickling of seed wheat at the next meeting.

Inverell.

The following paragraphs are taken from the paper by Mr. A. E. Sweaney referred to in last month's issue:—

THE BENEFITS OF TESTING.

If we are going to establish herd-testing, let us get the full educational benefit from it by going honestly into it. In applying the word honest, I do so, not in the narrow, but in the broader, sense. Let every dairyman joining an association submit his whole herd to the test. I know of early associations being broken up through individual dairymen submitting only portion of their herd so as to show a greater return than their neighbours.

I think it will be generally accepted by most practical men that successful dairying depends largely on the four fundamental principles breeding, feeding, careful management, and last, but by no means least important, selection. Taking only the last aspect of the subject, by it must be inferred selection of animals according to their relative butter-producing merits, which have been proved by the application of the scales and test. For it must be admitted that dairymen, in selecting their herds, have made these selections from appearance, though it is impossible for anyone to tell from appearance within anything like reasonable limits what the capabilities of a cow may be as regards butter production. How many dairymen are there who can even tell which of the cows in the yard is producing the most, and which the least butter, much less how many cows in the herd are earning a profit, and how many are occasioning a loss? Any ordinary business man can pick out the articles returning the greatest profit. He takes fine care that none are kept at a loss. The dairyman can be in exactly the same position with his cows, if he will only rise to the occasion. In the past, dairymen have been discouraged by being told that to arrive at the relative individual value of their herd they must weigh and test the milk of each cow, morning and evening, during the whole lactation period. Naturally they reply, "It's no good to me." The dairyman can see the great amount of time and labour such an undertaking would entail.

Now, the monthly record system is a wonderful simplification of the matter. It brings the keeping of individual records within easy reach of all dairymen.

Some five years ago it was stated that, according to the available statistics, the average butter production of our New South Wales dairy cattle was about 130 lb. per annum. Should this be true—and from my experience there is every reason to believe the production was not under-estimated—I think it is quite safe to say that this average return has been very materially reduced during the last few years.

This is indeed a regrettable feature, considering the great expansion of the industry, and my honest contention is, this retrogression has been brought about by the remarkable development of new dairying land of recent years, which required to be stocked. This has caused very keen competition for young dairy cattle, the demand for which at times could not be supplied. This result, and the consequent high prices, caused every dairyman to rear all his heifer calves, no matter from what "scrubs" they came, knowing they could be sold readily at from £3 to £3 10s. per head as soon as they were fit to wean. In previous years, when prices were normal, dairymen only reared a few heifer calves from picked cows, the rest being destroyed at an early age, as the skim milk from the dairy could be turned to better account per medium of the pigs. In consequence of this policy of rearing all and sundry, we have at the present time these "scrubs" scattered throughout our dairy herds in hundreds.

In my opinion, the great stumbling-block in dairying is the number of cows in the herds that are not earning a profit over their proportionate outlay and working expenses. There is no need for dairying to be such an uphill battle as at present, when by the adoption of more modern methods the production of the average herd can be more than doubled. I have often been asked the best and quickest method of putting a profitable herd together, and say in answer, select and retain the heifers from the members of the herd with the best butter records, and, provided the sire being used is from a cow of a good butter-producing strain, you cannot go very far wrong. Remember, the bull is half the herd, and in selecting him do so by his dam's producing qualifications, for no matter what champion bull he has been sired by, he will invariably throw stock characteristic of his dam. This may not be generally accepted by dairymen, but, nevertheless, I have proved it to my own satisfaction, and could not be induced to act otherwise. Of course, to breed up a herd requires some time. It cannot be accomplished in a few months. But it is the surest and quickest method of achieving the desired end.

Many dairymen are under the impression that if they can breed good milk-producing cattle, they can make good testers out of them by liberal feeding, but that is a very erroneous idea; better results would accrue from breeding for quality and feeding for quantity.

The ability of certain cows to produce rich milk is a characteristic inherited through the blood. The Jerseys are renowned for their characteristic richness of milk, yet I have found certain strains produce milk of exceedingly poor quality, which no amount of feeding of the richest food could improve. I have in mind an instance where a Jersey sire was used on a mixed herd for this express purpose, but the subsequent testing of the heifers as they came in proved their milk to be almost without exception poorer in quality than that of their respective dams; this was undoubtedly due to a poor strain in the bull inherited from a poor testing mother, as his sire was specially noted for the richness of milk of his progeny.

There is no doubt in my mind that our dairy cattle are decidedly retrogressing in this particular respect. Nearly every day we hear of cases of dairymen being prosecuted for the quality of their milk not being up to the standard required by law, and in many cases substantial evidence is adduced to prove that the milk is just of the nature as drawn from the cow. During the last season I tested many samples of milk from cows of my own suppliers that were considerably below the standard in richness, and in some instances the butter-fat was only just half the percentage required legally. In 14,000 tests taken by me on the farms during official testing duties a few years ago 7 per cent. of the cows tested under 3·0 per cent., and this from the daily average of the mixed morning's and evening's milk.

The question naturally arises, what is the cause of this retrogression? In my opinion it can be easily answered. For years past dairymen have been paying all their attention to quantity in their methods of breeding, without any commensurate regard as to quality; probably with the erroneous idea that quality can be fed into the milk. The Babcock test and its application has been more of a novelty on our dairy-farms than a practical guide, yet it is the only key to the gates of one of the main avenues to successful dairying.

It is quite a popular idea amongst many dairymen that cows of certain colour are either good or bad testers, and poor Old Snowy is always accredited with giving poor quality milk, whether she deserves it or not, though, as a matter of fact, a white cow is just as apt to be a good tester as a red, or roan one, the colour having no bearing on the matter. In a herd of 87 cows tested in the Condong district, a white cow, with that much-disliked pale-blue slaty skin, was easily top of the herd, producing 17½ lb. butter per week.

As already mentioned, many dairymen are of the opinion that the butter-fat content of the milk can be influenced by the feed, and they willingly assert that this or that class of fodder is the best or worst for the test. When hearing this assertion I have often wondered how many have tried an experiment, and carried it out correctly, to prove if such were true. Some eight years ago, while dairying on the North Coast, we had grown a particularly good paddock of English white rye, and every friend that came along, many of whom were South Coast dairymen, expressed regret at our growing white rye for fodder, claiming that it had been grown on the coast, but was discarded owing to the milk produced from it being of a very poor quality. However, I decided to

prove if such were true, and carefully took the average test of the milk, from the mixed sample in the vat morning and evening for the week previous to depasturing the cows on the rye. I then tested the mixed milk each milking for the seven days they were fed exclusively on this feed, but the results proved to be not in accord with what had been asserted. On the other hand, the flow of milk increased 12 gallons per day from the fifty cows milked, and the average test of the milk for the seven days was very slightly lower, which is usually the case when a herd is turned into more succulent feed of any description. The results of the average tests for both experiments were: Mixed pasture, a.m., equal to 3·51 per cent. average; p.m., equal to 4·07 per cent. The results for the following week from the rye were: a.m., average, 3·48 per cent.; p.m., 4·05 per cent. average. It will be seen that many of these ideas regarding the respective merits of different fodders may arise from unfounded conclusions, which have been passed along from year to year, and accepted as fact without experiments to prove or disprove. It must not be surmised that the cows were on inferior pasture paddocks. Paddocks that were in splendid condition, consisting of mixtures of rye grass, prairie, clover, and paspalum, had been specially saved for the experiment.

Generally speaking, every time a change of pasture paddock is made there is a temporary increase in the average test, perhaps for the first or second milking, probably owing to the stimulating effect on the cow's system. This I have proved many times by testing a sample from the mixed milk of the herd at different periods when a change was made. Dairymen can therefore see that it is advantageous to have the farm paddocked off as much as possible, even to the extent of a change paddock every other day. I have found, too, that a cow tests much higher if she comes in very fat, and in my opinion there is a decided affinity in the body fat of a cow and the butter-fat included in the milk she secretes. I have seen very striking demonstrations of this in our own herd, where certain cows coming in excessively fat tested very much above their former year's record, especially for the first three or four months while their extra condition was melting down. It therefore seems reasonable to suppose that the cow to some extent draws the fat requisite for her milk from her body fats.

We are all aware of the difference in the percentage of fat contained in the morning and evening milk, but why this is so, or what is the direct cause responsible for such, scientists have yet to discover. It is attributed to the intervals at which cows are milked differing, the morning's milk being usually the product of an interval of thirteen or fourteen hours, and consequently that of the evening is only ten or eleven hours. However, from experiments carried out, I have found this to have but a limited influence, as practically the same difference exists if equal intervals of twelve hours each are adopted.

The labour problem is the most discussed topic of the day; it is a matter for serious consideration, and requires immediate action. Of course the dairymen's first thoughts are directed towards milking machines. But have the milking-machines come to stay? And if so, are their results entirely satisfactory? My own experience of the machines is limited, being that only gained by observation from the plants of the few suppliers to the factory who are using them, but from the suppliers' point of view opinions as to their success at present are divided. But, apart from machinery, the problem is not altogether insurmountable. I think it can be shown that if dairymen will adopt the system of recording individual results as set forth, they can in a short time more than double the average return per cow.

A systematic method of culling and breeding to a standard of individual production will attain this end, and the first step necessary is to fix a standard, which must be governed by the initial outlay, upkeep, and working expenses incurred. A definite figure cannot be set down to apply to all, as these expenses vary in different herds and districts. Every dairyman must, therefore, work out his own standard by dividing the number of cows milked into the total expenses, the result giving the sum each cow must make to pay her own expenses. This is the basis to commence culling on, and by multiplying the number of estimated pounds of butter credited to each cow's account by the net price received for the butter, and by allowing her ½d. per gallon for skim milk, the dairyman can see how many cows in the herd are returning less than actual expenses. When these robbers are culled out, the standard can be raised each succeeding year by tacking on an extra per-

centage of profit over the expenses standard. The individual records, too, will enable dairymen to build up their herds again by indicating the members of their own herds whose heifers should be kept. If the keeping of records was established on a thoroughly sound basis, the average dairyman would in a few years be milking only half the number of cows for his present returns, and the labour problem would then be overcome, as he would be paying 50 per cent. less for labour, and would be receiving better returns.

I am of opinion that the records could be kept at the factory with considerable benefit to the industry. For instance, supposing each butter factory carried out this work for its own suppliers, it would necessitate the employment of two extra hands to be paid by the company, the same as the rest of the working staff; one to be kept out on the dairies taking samples, recording weights, and taking the necessary particulars of each cow, and forwarding same to the factory. The other hand would be in the factory receiving and testing the samples, recording the results, furnishing a return to the supplier, and attending to the despatch of boxes of sample butter.

A system under which dairymen would be their own testers would have many educational advantages. Of course, I realise it may not be so general as if undertaken by the factories or testing associations, but I believe the time is not far distant when dairymen in general will realise its absolute necessity, and take it up as part and parcel of every-day dairy work, the same as, for example, the adoption of the hand separator. One distinct advantage of this system of testing and recording results on the farm is that the enlightenment thrown on the work will make it more attractive, especially to the boys, who will see there is plenty of scope for brains in the scientific side of dairying.

The method referred to earlier in this paper as the monthly system of recording individual production can be conveniently carried out in the following manner, viz.:—Obtain a suitable book as a cow register, and as each cow freshens enter her name and date in the index on the front page with the folio or number of the page on which her results are to be compiled; on the top of that page enter the cow's name, with date of parturition. For example, say this date is the 1st of September, then this cow's testing day will fall on the 1st of each succeeding month for the entire lactation period. Rule the page off with five vertical lines, making column one, date of test, say 1st October; column two, lb. of milk per day, say 30 lb.; column three, average test, say 3·6 per cent.; column four, commercial butter per day, say 1¼ lb.; column five, estimated butter per month, say, 37½ lb. The dates for testing can be run down for nine months, and if the cow milks for a longer period, it only requires the insertion of a date for each succeeding month she continues to milk. The total production of butter is then easily and quickly arrived at by the addition of the eight, nine, or ten months' results, as the case may be. It will readily be seen that this system only requires on the average ten testings to give the cow's production, whereas several hundred weighings and testings would be required to comply with the daily record. A small four-bottle testing machine, costing about £2, would be quite sufficient, and as the dates fall due the dairyman, or member of the family, could put the tests through in one turn after tea. No computations are required, as ready reckoners for the purpose of calculating the amount of butter from a given weight and test of milk are now so common that they can be acquired for a few pence anywhere.

The third method of testing is per medium of Government subsidised testing associations, and, while both the abovementioned systems have many points to recommend them—from an educational point of view—especially the second, each has to give way to the third. In the first instance it is likely to become more general, as there are many dairymen who could never be persuaded to carry out the work for themselves, but who would be quite willing to pay a Government official the small fee required to have it done. The record certificate, too, carries with it a commercial value—a hall mark, as it were, which records computed from the other sources would not.

After I went through my different testing expeditions, extending upwards of six years, I always felt safe in advising a dairyman when selecting a bull to place at the head of his herd to be sure and ascertain if possible that his mother was a butter-producer, for I firmly believe the power of a bull to transmit to his progeny good dairy qualities has to be inherited from his dam. There is no doubt, in my mind, that the method adopted in judging dairy bulls

at our agricultural shows has been responsible for many a setback to the dairying industry, and after testing, and taking the results of the progeny of many of our so-called champion dairy bulls of our leading dairy shows in this State, including Sydney Royal, I have come to the conclusion that even our best judges do not know what points constitute the milking qualifications in a dairy sire. This is a very pertinent statement to make, but it is my opinion, based on practical results.

At the present time I have in mind a case of one of the most prominent dairymen in the State, who is breeding from one bull, and has done so for years, his ambition being to acquire a herd of cows the progeny of this animal. Every heifer, without exception, has proved to be an excellent butter producer, and as fast as they come in they pass the herd book butter test. This animal was once shown as a dairy bull at one of our leading agricultural shows, and though a well-cared-for animal, was passed over, and, as a matter of fact, was laughed at. Under present methods of judging he would never get a look in in a show ring.

In my opinion, there is room for the adoption of a better system of judging dairy bulls, and that is through their female progeny, or through the production of their female progeny. If this system were adopted in general an improvement in our dairy cattle would be the result, and dairymen would not be misled by breeding from these high-priced champions in the vain endeavour to produce improved dairy stock.

Lower Portland.

A lecture was delivered by Mr. A. J. Pinn, Inspector of Agriculture, at Lower Portland on 17th February.

Potato Culture.

The lecturer said the potato-growing portions of New South Wales were divided into two distinct sections, viz., the coastal districts and the Tablelands. Of the Tablelands, the Orange district was one of the largest, about 5,000 acres being cultivated for this crop. Crookwell and Guyra were also large producing centres, whilst Batlow was responsible for some very heavy yields of good quality tubers. Of the coastal districts, the Clarence, Dorrigo, and Hunter were the largest producers. Some of the Tableland soils, through continuous cropping, were becoming worn out and unfit for potato growing, owing to the lack of organic matter, and hay crops were being resorted to; in many instances green-manuring crops, such as peas and rape, were being grown, whilst fallowing was considered essential, for, as the lecturer explained, "fallowing spells success."

Discussing the possibilities of the coastal districts, Mr. Pinn said that two crops could be grown in one season, the first being planted from June onwards, and the second in February, but the second crop was not recommended, except for local or private requirements, as the Tableland crops were generally coming in from about March or April, and at that season of the year, the market being full, potatoes were always cheaper; thus, the price obtained would not recompense the coastal farmer, as the cost of production was much greater than on the Tablelands.

The seed for coastal requirements was generally obtained from the Tablelands. If the season had been dry, small whole seed was recommended, but if it had been good, larger seed cut to suitable sizes, having two or three eyes, was the most profitable. Growers should cultivate a plot of potatoes for stud seed purposes, obtaining a good variety or varieties, and by scientific and careful methods keeping them true to name and free from disease. This would ensure the best results from the crop grown for commercial purposes.

To prepare the seed before sowing, it was necessary to have it "shot"—that is, spread out in a dry place where it would get both light and air, and a fair amount of warmth. It would then shoot strong green shoots, which should not be allowed to grow so long as to be broken off in handling. For the autumn sowing it was advisable to use the seed whole. On no account should it be left in a pit, as the shoots would become long and spindly.

For coastal districts Manhattan, a blue-skin variety, was one of the best, producing as it does very few small ones, and even under dry conditions growing one or two large ones and no small ones. Early Vermont was also a good tuber, but more liable to rot, whilst Early Rose, an old-time favourite,

was also very susceptible to disease. Up-to-date, Adirondack, and Satisfaction were giving very satisfactory results at the present time.

One of the most important factors in the production of potatoes was to have the land in a perfect condition for the reception of the seed. It should be worked deeply and thoroughly, and where possible should have previously been fallowed, as fallowing not only sweetened the land but conserved moisture. The average distance for planting potatoes was about 2 feet 3 inches to 3 feet apart for the rows, and from 15 to 24 inches in the rows. As soon as the plants had grown above ground, the land should be harrowed, and at a later stage of growth cultivated to keep it in good condition. Light hilling was a good practice, as it kept the tubers covered deeper, and in places where the potato moth was prevalent made it more difficult for the moths to gain access to the potatoes.

Potatoes were gross feeders, and consequently required ample manure, and even in soils where organic matter was plentiful artificial manures might be applied with profit. A fertiliser, commonly known as P 5, was recommended. It should be applied at the rate of 2½ cwt. to 3 cwt. per acre at a cost of 18s. to 21s. The mixture consisted of superphosphate and sulphate of potash in the proportions of 16 cwt. of the former to 4 cwt. of the latter. The manure should be sown along the drills in close proximity to the seed.

Touching the question of Irish Blight, Mr. Pinn explained that it was caused by a fungus that appeared first on the leaves and worked downwards till it reached the tubers. To combat it, he recommended a spray consisting of 4 lb. bluestone, 4 lb. lime, and 40 gallons water. Spraying applied chiefly to the coastal districts, for spraying on the Tablelands was seldom thought of, as the low prices generally obtained for the crops (on account of the season) would not allow too much expense in production. For Wet Rot, drainage was the only effective remedy, and for Scab, a solution of one part formalin to 500 parts water was recommended. A lantern picture was shown of another disease, known as Corky Scab, which fortunately was unknown in this country. It was said to be much worse than Irish Blight. Eelworms were very troublesome in some parts, as they worked all round the tubers and thus prevented their growth, whilst the Potato Moth was sometimes responsible for the destruction of the whole crop in a district, especially in dry seasons. The moth laid her eggs on the foliage, and the grubs went down into the tubers. To guard against this pest, sow the seed deeply, and hill the plants as high as possible.

Middle Dural.

Mr. Massy, M.R.C.V.S., delivered a lecture on "Contagious Abortion and Mammitis in Cattle" before members of this branch on 18th February, his clear statement of the nature and treatment of the disease being much appreciated by his hearers.

The monthly meeting was held on 26th February, a fair number of members being present.

The Secretary intimated that he intended to read a paper on his experiences with poultry at the next meeting.

Miller's Forest.

The monthly meeting of the Miller's Forest branch was held on the 25th February. The attendance was excellent, and the Chairman (Mr. Jas. Priddle) presided.

The Secretary dealt briefly with the ways and means of preparing cream for first-grade butter. He advocated the prompt despatch of all cream to the factory, scalding all utensils as soon as used, and keeping all cream cool until despatch to the factory.

Mr. Markham read an interesting paper on lucerne growing, indicating the land and the cultivation suitable for lucerne, the quantity of seed to

be sown, the time of sowing, and certain things which are detrimental to lucerne growing.

Mittagong.

A demonstration of fruit packing was given by Mr. W. Le Gay Brereton, Orchardist of Glen Innes Experiment Farm, at the Farm Home, Mittagong, on 18th February. It was well attended, and proved very instructive. The standard pack, both in wrapped and unwrapped fruit, was demonstrated by Mr. Brereton.

Nimbin.

The monthly meeting was held on 27th February. The new fodder plant *Saccharum officinarum* was discussed by members, the consensus of opinion being that it was better than sorghum, and softer for cattle than cane. A number of members spoke on the value of cane as a winter feed. It was agreed that in order to keep grass down it was necessary to keep the ground clean at first, and the best way to do so was to plant the cane on the square system, enabling it to be scarified both ways.

Sackville.

At a meeting of this branch on 3rd February, the Chairman, Mr. C. Kaiser, read a paper, from which the following extracts are taken:—

Experiences with Varieties of Fruit.

The aggregate of losses in our orchard districts arising from the planting of unsuitable varieties must be very large, and the prospective grower cannot be too careful in his choice. If he is in an old fruit district, he should be largely guided by local experience; if he is a pioneer, he should choose such sorts as are known to thrive in districts of similar soil and climate, or those known to tolerate a wide range of conditions. This is not to be taken as advice to plant nothing else, but as indicating the attitude towards the bulk planting: the rest should be experimental. What I have to say applies only to this district, and it must be remembered that differences in soil and very small differences in climate may have a great influence on the habits of trees.

If there is any choice of soils available on the holding, choose the lighter and deeper for the orchard. If there is nothing but heavy, stiff clay, sell out and try elsewhere. If the holding is small and yet varies in the quality of the soil, and if it is desired to plant the whole of it, put pears and apples—but especially pears—in the stiffest soil. For citrus fruit, reserve the best light loam. The immediate banks of the river flats, with their rich, deep, sandy loams, are ideal for citrus fruit, though there is one disadvantage—the fruit will not hang as it does on high land, and mandarins have a tendency to puff soon after ripening.

One thing for which the grower should always be on the look-out in any of the summer fruits, young stock as well as old, is San José scale. Study its appearance closely, and as closely inspect young trees before planting.

If there is much scale showing, do not plant the young tree, but burn it. Once badly infested, it is very difficult to get a young tree started thriftily, and it is the first few years of growth that count most.

In any case, do not plant any deciduous fruit, stone or pome, without treating by fumigation or with lime-sulphur as a precaution. I have frequently found the scale very thick about the collar of young pears and apples, with very little showing elsewhere. I know of old orchards on the Hawkesbury River (planted when this pest was unknown and the trees in which had met and interlaced at 24 feet apart) where efforts to get young stock started have proved quite unavailing for many years, simply because this pest had been disregarded.

In these days cultivation and manure are useless without the co-operation of the spray pump.

Though this is not pre-eminently an apple district, some varieties, mostly early ones, do very well, and will pay the grower handsomely. The good later sorts, which do so well in the colder districts, will grow vigorously enough, but will not fruit. My experience is limited to a few varieties. Carrington, Trivett, Jonathan, Granny Smith, and Rome Beauty all fruit well so far, though my trees are not very old yet.

I like Trivett best; it is a handsome apple, well liked in the market, and sells well. I have known it to bring 15s. to 17s. per case in dry seasons. Carrington is not a bad sort, but it has one peculiarity which I know no other tree to possess. I planted twenty-five trees sent for Carringtons, and when they fruited I thought the nurseryman had sent me three distinct sorts. Though all ripened about the same time, one was of a very bright red, another varying from a pale to a bright streaky red, and the third of a very deep dull red. I am told that it is its habit to so vary. Scions from the same tree worked on similar stocks will develop these differences. As far as I know, this characteristic is unique.

Of pears my experience is not large. Like the apples, most of the best market varieties do better in colder districts than this. But two varieties that do splendidly are China and Kieffer. The last is a good pear for the canners, and if kept after pulling till mellow, it is by no means to be despised for dessert. I have some Jargonelles, which I do not care much for; they are mostly shy bearers with me, and their only merit is their earliness. Napoleon, otherwise Vicar of Winkfield, is not appreciated in the markets. Its bearing habit is irregular, sometimes giving a very heavy crop, and then for years in succession very light. I have kept some for months, but could not get them mellow. Kieffer and China are heavy and consistent croppers—in fact, Kiefer will mostly carry too much fruit, and should be thinned. Prices are never high for China or Kieffer. I have about 150 Williams pears, young and fruiting, but if the land they are on were suitable, I should prefer stone fruit. They are inclined to be shy bearers, and this season (the only one in which I have had a good crop) they will not sell. Williams has two serious faults—it takes very little wind to send a large part of the half-grown crop to the ground, and it is very subject to Black Spot. Following the Department's recommendation, I used lime-sulphur with the arsenate of lead spray to check it, but the only result I can see is that the spray russetted the fruit, which now has russet marks as well as the Black Spot. Of course, it has been an ideal season for any fungus pests, and perhaps if I had not used the lime-sulphur the spot would have been worse. I have always found it a big advantage to pull as early as possible. We mostly have about a fortnight of the market to ourselves before the Victorian Williams arrive. Unfortunately, this year they were a good fortnight late with me, and the Victorian crop was in the Sydney market before mine. Most years, I have obtained from 6s. to 10s. per case. It is a mistake to plant a block of Williams pears alone. Some other variety that blooms about the same time should be planted alongside. They crop much better if the blossom is fertilized by the pollen of a different variety. With my bearing trees, Jargonelles serve this purpose, and with the younger section of Williams I have planted Clapp's Favourite and Packham's Triumph. I had a dozen or so of fruit from the Clapp's Favourite this season. They are much like Williams, with a red cheek, and they are earlier. If they crop well they should be a good useful sort, and should meet a good market.

Of peaches, there is a multitude of varieties to choose from. I can only speak of a dozen or so of which I have had personal experience. China, a one-time favourite on the river, is not much grown now, though, to my taste, when well grown and ripened on the tree it is the best and most highly flavoured of all peaches for dessert. It is not much liked in the market these days. Several China hybrids, like Edward VII and Bell's November, are as early and are better selling peaches. Both these sorts require to be kept in vigorous growth and to be hard pruned, and the crop to be thinned, otherwise the fruit is small and of little value. Some growers have done very well in the past with Briggs' Red May, but I have never had much satisfaction from them. They are uncertain croppers, and in common with several other early white-fleshed peaches, such as Hale's Early and Ruby, are subject to a disease which is of unknown origin, and for which, so far, there is no cure. In certain seasons (usually damp and rainy ones), though the fruit buds open and the fruit sets, the leaf buds will not start, and we have the trees in late October covered with small peaches with hardly a leaf showing. Needless to say, the fruit falls off, the

bare twigs die, and the few buds that start growth have to re-make the tree. I have made nothing off my Briggs' these three years, and I would not recommend anyone to plant them. Mine get another year's trial, then, if they do no better, out they come. With the other sorts mentioned, they are also peculiarly susceptible to Brown Rot, which promises to surpass San José scale and Fruit Fly as a curse to the fruit-growing industry.

I like the yellow fleshed varieties best. I grow chiefly four sorts. Powell's Beauty, Elberta, Globe, and Italian Cling, and I have some young Nicholl's Orange Cling coming on. It would be difficult to find a peach to excell Powell's in size, colour, or flavour. I can generally start pulling just before Christmas, when peaches are valuable, and the last of them go with the first of the Elbertas. There is room for another sort between Elberta and Globe, as there is nearly a week between the last of the one and the first of the other. At the finish of the Globe I have a few of the Comet and St. John's Day varieties to pull before the Italian Cling.

Elberta is a fine peach; the tree is hardy, and will stand more neglect and more ill-usage by scale than most other sorts, and still remain a constant cropper. The fruit is large and eminently suited for canning purposes. Its fault is that, if left till colour develops, it is apt to be too soft to ship. Notwithstanding its merits, I think Elbertas are being over-planted. We all know the busy time "Elberta week" is on the river, both for the growers and for the cargo boats, whose carrying capacities are then taxed to the uttermost. The usual advice given to the grower should then be disregarded. It does not pay to be careful in grading and packing your stuff. To be so is to waste time and effort. Such a quantity is marketed just then that the agents cannot or will not handle it in a retail way. It is practically all handed over to the factories at a fixed price all round. I have for many years—this one will be the last—carefully graded my Elbertas, and packed the prime, large, coloured in half-cases, and they have always brought the same price all round—just the same as other people who tumbled them into the cases, leaves and all, straight from the trees. I have thus realised less cash for the best, the stuff I gave the most time and attention to, than for the worst. The half-bushel cases brought 2s. 6d. each and the bushels 5s., and as the expenses on two halves amount to 8d. more than on a bushel case, I have been that much behind in the cash realised for my best lots. There are young orchards being planted now in which 50 to 70 per cent. of the trees are Elbertas. I think the owners are ill-advised, and are laying-up trouble for themselves. It means seeking for a lot of casual labour at pulling time—labour which it is not always too easy to obtain, and for which high rates have to be paid. It is only fair that a man should be paid better for work which lasts but a week or two, and to which he has to mostly make a long journey. Another thing is that the factories cannot handle such a pile of stuff in the short time in which it is on the market. For them, too, it means that casual labour must be engaged for a week or two. And worst of all—for us—the market is at the mercy of the factories. A steady supply kept up right through the season would be better for all engaged in handling fruit—for the grower, the worker, the agents, and the canner and his workers. Globe is a good peach, not so hardy as Elberta, and the trees need to be kept in good health and vigour, or the crops will be light. With proper attention it is a good cropper. I do not care a great deal for Comet or St. John's Day, though they are useful as keeping up a succession. My last peach is Italian Cling. This variety is good in every way but one; it is hardy, a good cropper, and sells fairly well, but being late in the season it is subject to Fruit Fly infestation. If a grower cares to risk that disadvantage, it is a good sort to plant. There is one wrinkle that may not be generally known to growers; that is, that it is an aid to getting good colour in your peaches if you work them on stocks grown from Italian Cling seed. Appearance counts for much in the sale of fruit for the shops, and colour adds much to the appearance of fruit. I have tried Royal George, Newington, and Lord Palmerston, but have discarded them all; the market does not want them.

DEPARTMENTAL NOTE.—The experience of the Department has been that even in low situations subject to frost, where mandarins are worked on orange stock they are not so liable to become puffy. It is considered that if the Briggs' Red May peach trees are healthy and strong, it would be better to rework them rather than to grub them out. It is found that young trees planted where old ones have been growing do not do well, a fact that may also partly explain the failure of young apple trees, attributed in the paper to San

José Scale. Reworking as against replanting has also the advantage that only one season is lost instead of perhaps two or three.

St. John's Park.

Mr. J. Hadlington, Poultry Expert, visited this district on 5th March, and inspected most of the poultry farms.

POULTRY-KEEPING.

Subsequently when addressing the local members of the Bureau he expressed the opinion that there was a noticeable improvement in the quality of the stock on many farms. A feature of the visit was the selection of typical specimens of good and bad layers, and marking many of them with a leg band for the purpose of identification. A lively interest was exhibited by poultry-keepers, and many questions covering the whole scope of poultry-keeping were asked and answered. Farmers were urged to look well to the equipment of the rearing portion of their places, as upon it hung much of their chance of success. Poor or makeshift arrangements for rearing meant, in most cases, much loss and disappointment.

Complying with the request of the branch, some cockerels were caponised, but it was explained that commercially there was nothing to be gained by caponising under local market conditions. Moreover, where a number of cockerels were required for breeding purposes, it was desirable to have a large number to select from. If they were to secure the pick of their flocks, they could not afford to caponise to any extent, because caponising had to be performed long before a proper selection could be made. If caponising was resorted to, therefore, too many of the most valuable birds would be destroyed. There was no advantage in weight to be gained by caponising, unless the birds were kept to a greater age than, say, 5 months. Most Australian breeders wished to quit the cockerels earlier than that, and from a market point of view it was not desirable or profitable to keep them much longer.

Tallawang.

The annual meeting of this branch was held on 27th February, when the following office-bearers were re-elected:—Chairman, Mr. W. Morgan; Vice-Chairmen, Messrs. C. Lincoln and F. Collins; Treasurer, Mr. M. O'Connor; Hon. Secretary, Mr. George Lincoln, junior.

It was decided to allow members' subscriptions for the ensuing year to remain at 2s. 6d. per annum; meetings to be held on the fourth Saturday in each month.

It was agreed that the cultivation of sisal hemp should be discussed at the next meeting.

Taralga.

The usual monthly meetings of this branch were held on 20th February and 8th March, Mr. Quinn presiding.

At the first meeting, details were arranged in connection with the £10 10s. prize given by members for the exhibit of farm produce at Taralga Show. It was decided to ask the A., P. and H. Society to divide the money into three prizes, 1st, £5 5s., 2nd, £3 3s., and 3rd, £2 2s. It is expected that some very fine exhibits will be forwarded.

At the March meeting members expressed satisfaction at the decision of the Department to establish farmers' experiment plots in the district.

Mr. J. G. R. Bryant, Assistant Fruit Expert, visited the district and gave a demonstration in summer pruning. Mr. Bryant was greatly pleased with the possibilities of the district. He urged intending planters to stick to

a few standard varieties. Of apples, such varieties as Five Crown, Jonathan, Granny Smith, and Fanny (Pomme de Neige), would entirely fill all requirements, and of pears, Packham's Triumph and Winter Nelis.

Trial plots of grapes might be planted in suitable positions.

Mr. Bryant explained the idea of pruning the young tree so as to provide balance and spacing.

Tatham.

The usual monthly meeting was held on 8th March, when Mr. J. J. Riley gave a lecture on the horse's hoof and legs below the knee. He carefully explained the structure of the feet and the different methods of shoeing. Hot shoeing was condemned, as it drew the moisture out of the hoof and made it brittle. The causes and treatment of side-bone, ring-bone, splints, stone bruises, and cracked feet were dealt with, and numerous questions answered satisfactorily.

A hearty vote of thanks was accorded the speaker for an interesting and instructive address.

Members are interested in the clearing of land by explosives, and a move is being made to have a demonstration as soon as possible. On every farm there are trees and stumps that are an eyesore, besides hindering the cultivation of the land, and harbouring weeds.

Temora.

A meeting of this branch was held on 13th February, Mr. De Little (Chairman) presiding.

Mr. Reynolds read a paper, from which the following paragraphs are taken:—

PREPARING THE SOIL FOR THE SEEDING OF THIS YEAR'S CROP.

The Department of Agriculture is continually experimenting in the production of new wheats and their cultivation, with the result that new methods and new varieties are constantly rendering wheat-growing possible, and in an average season, I might say, profitable in districts previously regarded as too dry for it; but the trend of the average farmer is for progress, and there is every indication that as the years bring new and advanced methods to bear, the yield of the land will show a phenomenal increase. The last few years have seen the development of one of the strongest factors in our agricultural progress—*the repeated tillage and cultivation of the soil.* We have been rather slow to follow the example of the American farmers in the way of soil cultivation, but it will be only a matter of time now when we will be abreast of them.

In preparing the land for wheat we have the winter or long fallow, the summer or short fallow, and new land. The winter or early fallow is in principle the best method, as the land is kept in good condition to make a perfect seed-bed to ensure germination and in all probability a good crop. Speaking generally, the spring tooth cultivator is the most suitable implement to work fallow, as it mixes the ground by lifting the bottom soil to the top, for in harrowing the finest and best ground works to the bottom. The skim plough, or disc cultivator, to my mind, in turning the surface lets the moisture escape. In clayey soil that has worked into clods, it is said that the disc-cultivator cuts up a finer seed-bed, but I think if a light roller, or better still, a packer is run over these patches before drilling, it is the better plan to adopt.

Next we have the stubble land. I think it pays best to make summer fallow of it in this way. As soon as possible after the straw has been got rid of, give it a light discing or cultivating, so as to encourage whatever weeds or black oats there might be close to the surface to grow. If this land is well ploughed instead of being cultivated, the first rains will only germinate the oat or weed seeds that are near the surface, but will leave untouched those that lie deeper,

and when it is worked down before sowing wheat it seems to bring these seeds to the surface to germinate with the wheat. When ready for seeding, give this stubble land that has been cultivated a shallow ploughing sufficient to kill those oat or weed plants that are growing. Give a thorough harrowing before drilling.

New land that is to be sown this year should be ploughed as soon as sufficient rain falls, then after being harrowed let it lie in fallow as long as time will allow. Then work the surface only lightly with a disc-cultivator before seeding. This cultivating helps to fill in the spaces between the stiff clods, making a firmed seed-bed. Running the roller over this after the wheat is well rooted will also improve it.

DISCUSSION.—The Chairman said that considering that the soil this season had never been properly set on account of the light rainfall, and was practically in the same condition as fallow land, he favoured the idea that a shallow cultivation was all that was necessary, and one of the points he would like to hear discussed was, which was the most efficient implement to use in preparing the soil for the seed drill. Mr. Reynolds' paper had gone into this matter, and he would like to know the general opinion of members on the subject.

Mr. WARREN rather favoured the drag implements, such as the spring-tooth or the ordinary stump-jump cultivator, as by these all the lumps were brought to the surface, making a good mulch and leaving the fine soil below to receive the seed. The disc-cultivator was undoubtedly the best for destroying weeds in the fallow, but in preparing soil for the drill it had the disadvantage of turning the lumps and crusty surface to the bottom, making a bad seed-bed. In regard to time of sowing he had lost crops from too early planting, while all the later conditions for growing crops were entirely favourable. He did not favour sowing crops early on a dry or semi-damp seed-bed unless sown without fertiliser and also without bluestone treatment. He would not sow with superphosphate until May, unless there was already an ample supply of moisture in the soil.

Mr. MALLINSON considered the time for sowing depended entirely on weather conditions. There was a risk in sowing in March, though it was very successful if there were no very light rains, until the following month. For the present year he would advocate, for clean loose land, discing only in the preparation for seed.

Mr. J. DONALDSON was in favour of the spring-tooth cultivator, which pulverised the soil and brought the lumps to the top. All the fine soil should go down. Ordinarily he was a strong advocate of good cultivation. It would pay to cultivate the land well.

Mr. L. DONALDSON thought the spring-tooth cultivator best suited for preparing land in its present state. If a disc-cultivator was used it should be followed by the spring-tooth implement before drilling.

Mr. REINHOLD said that in sowing dry there was a great tendency in the soil to get a hard crust, especially in the bottom of the drills, after heavy rains. He advocated that the land should be harrowed immediately after the rain (or as soon as practicable). He had found land so treated allowed the young plant to break through easily, and the results were much better than where the soil had not been so treated.

THE CHAIRMAN was of opinion that land should be cloddy to a certain extent. A dust mulch would keep moisture out as well as keep it in.

Mr. DEW said that during twenty-three years of experience in Victoria the favoured time for sowing was April and May, and he had never had to plant twice in the one year. He favoured harrowing when the crop had formed the second blade, and thought the skim plough preferable to the spring-tooth cultivator.

Mr. BUSHELL said that after the 1902 drought he ran over the land with a spring-tooth cultivator and then the drill. He did not use much seed or manure and got 24 bushels to the acre. When ploughing damp land he always found harrowing on the same day as ploughing the best way to keep the moisture in. He favoured rolling after drilling land that had a little moisture.

Mr. MALLINSON moved "That in the opinion of this meeting the best manner of working the land for this season is by shallow cultivation."

This was seconded by Mr. DE LITTLE, and carried.

At a special meeting of this branch a paper on pickling seed-wheat for bunt or stinking smut was read by Mr. J. H. Mallinson. The paper, which

related the life-history of the disease and recommended treating the wheat in a solution of 1 lb. bluestone to 5 gallons water, created an interesting discussion in which several farmers contended that the solution mentioned was too strong. They preferred 1 lb. bluestone to 7 or 8 gallons water, as strong enough to be effective and less injurious to the seed.

The branch has sent out forms to members and other representative farmers with a view to obtaining comparative results of the different varieties of wheat grown in the district. The idea is to collect these returns over two or three years, and to ascertain which are really the three best yielding varieties grown in the district.

The Chairman (Mr. De Little) presented an analysis of the returns received from members for the first year. He pointed out that the past was a very bad season on which to form conclusions, but nevertheless something would be gained from having a record of results in a severe drought season for comparison with, he hoped, the results of better seasons. Members were invited to peruse the tabulated return prepared by Mr. De Little, with a view to discussing the matter at a later meeting.

Tumbarumba.

On 3rd February, Mr. C. W. Burrows, Assistant Inspector of Agriculture, conducted a demonstration in clearing and subsoiling with explosives.

As it was the first of its kind held at Tumbarumba under the auspices of the branch it created a lot of interest amongst the members.

After explaining fully his mission, Mr. Burrows selected an apple-tree stump, about 4 feet 6 inches in diameter and nearly solid.

Forty-five plugs of gelignite were placed in position in eight different charges, and exploded by a battery from a distance of about 100 yards.

The result was highly successful. The stump was lifted about 2 feet up and completely shattered, ready for burning. Mr. Burrows explained that this was really the object. To shatter the tree into a condition in which it would burn freely was better than to blow it down, where it would generally be hard to burn it.

He next proceeded to show the possibilities of explosives for subsoiling in the orchard. A spot was chosen between the trees, and after boring about 18 inches half a plug of gelignite, with fuse attached, was placed in position and tamped. The explosion loosened the ground for some yards around. The possibilities of this district as a fruit-growing centre made this demonstration even more interesting to the onlookers than the first.

The gelignite procured locally costs 2d. per plug, and the detonators 2d. each. The total cost of removing the big stump was thus 8s. 6d., which without doubt showed a great saving both in time and labour, as it would be impossible to leave the stump in such a condition by any other means without days of hard work.

United Peel River.

The regular monthly meeting was held on 6th March, when three new members were enrolled. A lengthy discussion took place on the effects of the drought in the district and the advantage of water conservation.

Apiary Notes.

April.

R. G. WARRY, Demonstrator in Apiculture.

Honey extraction will be finished for this season in most of our apiaries, and whatever work amongst the hives needs attention must be done with the greatest caution in order to avoid starting the bees robbing each other's hives. As is frequently stated, there is little risk of starting robbing during a good flow of honey, but with changeable weather and a paucity of nectar in the surrounding country, carelessness in the matter of leaving hives open or honey exposed will quickly start robbing, and can easily lead to an uproar in an apiary which is difficult to check.

Whatever has to be done at the hives should be done as quickly as possible, and any part of a hive laid aside, such as a super of extracting combs, to permit access to the brood chamber or any other part, ought to be covered so that bees cannot pilfer it. Make sure that all honey which may have dripped on to the floor of the honey room has been cleaned up, and that honey or anything that might attract bees is properly covered, so that robbers cannot reach it.

The condition of an apiary during the flow of honey is very different to its condition soon after the flow has ceased. In the former instance, practically no robbing can be noticed; colonies can be handled with very little stinging, and operations such as making increase, introducing queens, rearing queens, and generally examining colonies, can be easily and successfully carried out. But a day or so after the flow has ceased, or, indeed, if a flow should cease temporarily through a change of weather, the bee-keeper must be on the watch for robbing amongst his colonies. At such times, weak or queenless colonies are soon found by robber bees and must be protected. The latter should be given queens as quickly as possible.

Colonies that are being robbed can soon be discovered. The bees about their entrances will not be normal, but numbers of them will be seen to be fighting, and on closer examination it will be found that the bees belonging to the colony are attempting to prevent strangers entering their hive. Watching still longer without interfering with matters, robber bees will be seen rushing out or being chased out of the hive and flying away, and in a little while the number of robber bees attacking the hive will be seen to have increased. If the trouble is not checked, robbing may spread through the apiary until at every hive where there is a chance for robber bees to enter, a cloud of angry bees will be fighting outside the hive and tearing honeycomb to pieces inside it.

THE NEW QUEEN-BREEDING APIARY AT THE HAWKESBURY AGRICULTURAL COLLEGE.

So soon as robbing is detected, the hive or hives to which robbers belong should be found. This can be done by strewing a fairly thick layer of flour at the entrance of the colony which is being robbed; then, after smoking the colony and standing at a little distance from it, most of the robber bees can be seen powdered with flour and returning to their own hives. The entrances of these and any hives being robbed should be contracted so as to allow the passage of only one bee at a time. A stick, the top bar of a frame, some rag or grass, can be used for contracting the entrances, and any holes, cracks, or ways into hives, except proper entrances, should also be stopped up. The contracted entrance in the case of the hive that is being robbed gives that colony a better chance to defend itself, as there is less space to guard against intruders. At the same time the contracted entrance at the hives to which robbers belong prevents great activity there.

If contracting entrances and stopping up holes and cracks does not check robbing, cover the entrances of the hives that are being robbed with loose piles of grass, and spray or sprinkle this with water to which has been added enough carbolic acid to make the water smell fairly strongly of carbolic. As a rule, robbing, if seen at its beginning, can be checked in this way, but if a colony should be found badly attacked and the trouble is spreading amongst the hives, this colony should be closed up altogether. Robbers will attempt to enter it, but will soon tire when they find they are baulked. By closing this hive completely numbers of robber bees are confined in it, and they should be kept there until a little while before dark, when the closed hive should be opened and smoked; the robbers will then leave it and return to their own hives.

It is inadvisable to leave an apiary during a scarcity of honey without someone to guard against robbing. If a bad state of affairs should be found, the entrances of all colonies should be contracted, as described, with grass piled over those where robbing is worst, and cow-dung fires lighted about the yard. When doing this, keep plenty of water at hand, as there is no small risk of starting a grass fire in the apiary, and hives of bees catch fire readily and burn well. In fact, it is a good precaution to wet the ground all round each fire, or to light the fires in old tin pans or on sheets of iron. Cow-dung fires, if kept going well with damp fuel, will give a dense cloud of smoke which soon subdues robber bees; the fires should be continued until dark, when the apiary will settle down. Next day, the bees will still be excited, and care must be taken to stop robbing as soon as it starts.

Bad cases of robbing, where smoke fires are necessary, are not frequent, but if neglected at the start, robbing can increase to such an extent that there is no alternative.

Orchard Notes.

APRIL.

W. J. ALLEN.

Harvesting.

THE work of picking, packing, and marketing apples will continue this month; also the storing of any late apples or pears in either cool stores or cool store rooms in the orchards should receive attention.

The fruit should be picked during the cool part of the day and the stems retained on the fruit.

Green Manuring.

If this crop is not already in, it should now be sown with as little delay as possible.

Planting.

Planting of citrus trees may be continued this month. Where autumn planting is practised care should be taken in handling the trees not to expose the roots to either wind or sun. Those who intend planting out new orchards should get the land cleared and subsoiled as soon as possible, and the trees ordered. In buying apple-trees see that they are all worked on blight-proof stocks, as trees worked on such stocks can more easily be kept free from woolly aphis.

Refills.

The ground should be well worked up where such trees are to be planted in established orchards, and if the soil is poor or hard it would be as well to remove a load or two of the poor soil, and fill up the hole with good soil if there is any handy. Before filling up with this good soil it would be as well to sprinkle a few pounds of lime in the bottom of the hole. This will assist in sweetening the ground.

Scales on Citrus Trees and Fruits.

If trees or fruit are dirty, it would be well to fumigate immediately, provided the trees are in good condition, otherwise this work should not be carried out. If fumigation can be done now, it will be found that most of the scale will have fallen off the fruit by the time it is ready to be sent to market. Other States do not want spotted fruit, even though the scale may be dead. It is only those who have clean fruit who will be allowed to market it in New Zealand and the different States of the Commonwealth. Fumigating tables may be had on application to the Department of Agriculture.

How and When to Apply Lime.

Freshly burnt lime may be distributed over the orchard in small piles and covered with earth. It can then be spread with the shovel after the lumps have crumbled to pieces. Burnt lime, crushed and screened, may be applied with a drill or a lime distributor. Lime should not be ploughed under, but should be thoroughly and promptly mixed with the soil by means of the harrow or cultivator. If the soil is distinctly acid it will hardly be worth while to apply less than 15 cwt. to a ton to the acre.

Cultivation.

In cases where the grower intends to give his orchard two ploughings, the first should be given as soon as possible, otherwise the land should have a complete rest until the winter ploughing, when all weeds which may have grown will be turned under while green, and before they seed.

Manuring.

Manure should be carted out and spread amongst the trees; soil, road scrapings, cleanings from drains, and vegetable refuse of all kinds should be collected and carted into the orchard. These all make valuable soil renovators. Bush soil and leaf mould should be placed around both young and old citrus trees. With this treatment the trees pick up very quickly.

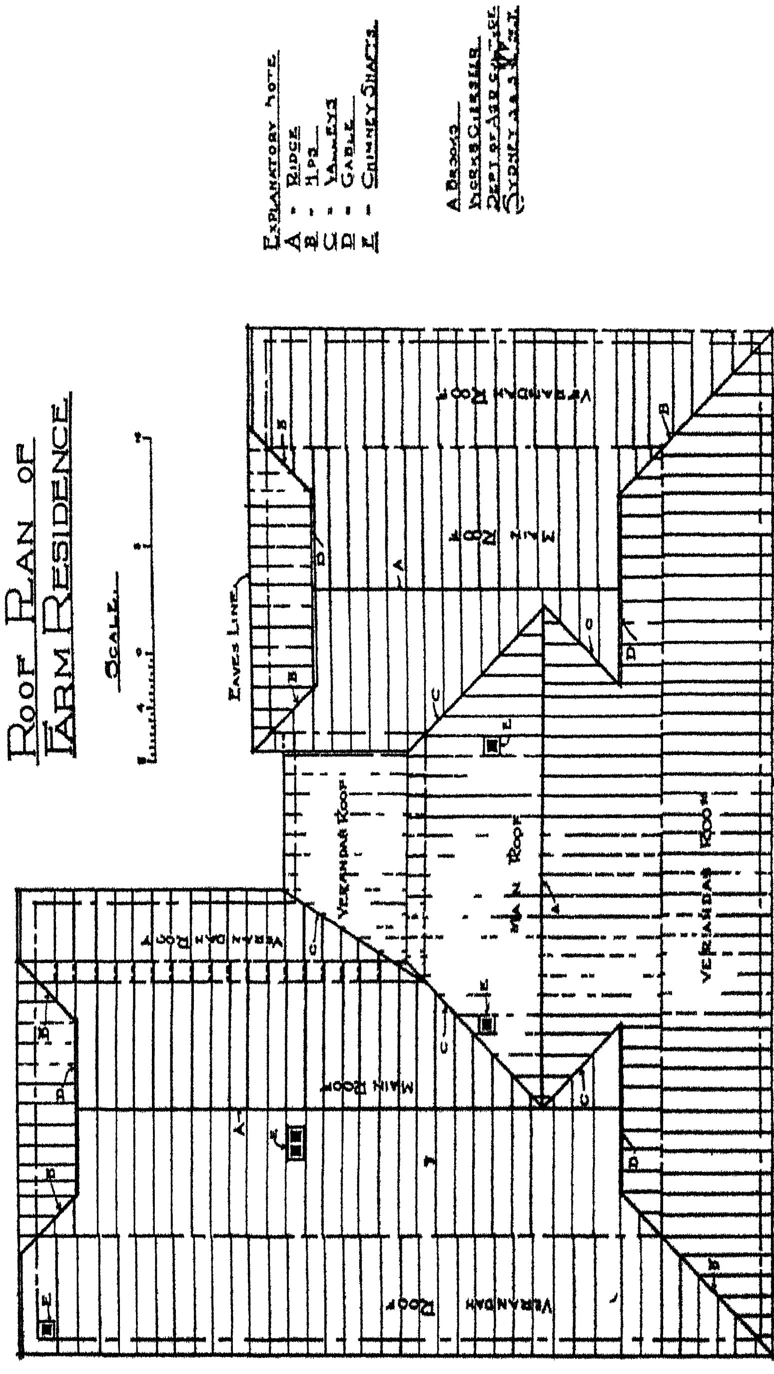
Design for a Farmer's Cottage Residence.

A correspondent in referring recently to the article under the above title in the November issue of the *Agricultural Gazette* (page 935, volume XXV), stated that the plan was a splendid one, and was the best idea he had seen for some time. "What is badly wanted, however, is the plan or lay-out of the roof. I would be—and I am sure many more would be—thankful for the roof lines."

In reply, Mr. A. Brooks, Works Overseer, supplied a plan of the roof, showing the lines of construction, as when the building would be completed, and stated that if a section only of the building is required, the roof should be hipped at the point to be continued, so that the materials can be re-used in the extension.

It should be noted that the plan shows the rafters at 18-inch centres as for a tile covering, but if corrugated iron is to be used, one half of this number would be sufficient, *i.e.*, at 3 feet centres.

The illustration will be found on the following page.


Roof Plan of Farm Residence
Scale
Explanatory Note
A - Ridge
B - Hips
C - Valleys
D - Gable
E - Chimney Shafts
Eaves Line
Veranda Roof
Main Roof
Verandah Roof
Eaves Line

Government Stud Bulls available for service at State Farms, or for lease.

Breed.	Name of Bull.	Sire.	Dam.	Stationed at—	Engaged up til.
Shorthorn ...	Melba's Emblem (Vol. IV. M.S.H.B.)	Emblem of Darbalara (100 M.S.H.B.)	Melba 3rd of Darbalara (1058 M.S.H.B.)	Berry Farm ...	‖
" ...	Imperialist ... (183 M.S.H.B.)	Florio	Lady Nancy of Minembah.	Berry Farm ...	*
" ...	The Irishman (imp.)	Tipperary Bull	Colleen Bawn (imp.)	Robertson ...	17 Mar., '15
Jersey ...	Grenadin (imp.)	Attorney (9477)	Cyril's Carnation (imp.).	Yanco Farm ...	*
" ...	Trafalgar ...	Best Man ...	Rum Omelette	Cowra Farm ...	*
" ...	Kaid of Khartoum	Sir Jack ...	Egyptian Belle	H. A. College ...	*
" ...	Leda's Retford Pride.	Dinah's Lad ...	Leda's Angel..	Wagga Farm ...	‖
" ...	Goddington Noble XV (imp.)	Goddington Noble	La Franchise 3rd.	"	*
Guernsey ...	The King's Mirror	Calm Prince ...	Vivid (imp.)...	Wollongbar Farm	†
" ...	Star Prince ...	Calm Prince ...	Vivid (imp.)...	Casino	23 April, '15.
" ...	Godolphin Moses (imp.)	Golden Hero of the Vauxbelets (1929)	Rosetta (6509)	Inverell	6 April, '15.
" ...	Hayes' Fido (imp.).	Hayes' Coronation 3rd.	Hayes' Fi-Fi 2nd.	Wollongbar Farm	‖
" ...	Claudius (imp.)	Golden Star II..	Claudia's Pride (imp.).	Murwillumbah ...	30 June, '15.
" ...	George III ...	King of the Roses	Calm 2nd ...	Wollongbar Farm	‖
" ...	The Peacemaker	Calm Prince ...	Rose Petersen	Wollongbar Farm	*
" ...	King of the Roses	Hayes' King ...	Rosey 8th (imp.).	South Kyogle ...	30 July, '15.
" ...	Lauderlad ...	Laura's Boy ...	Souvenir of Wollongbar	Mullumbimby ...	6 Oct., '15.
" ...	Belfast	King of the Roses	Flaxy 2nd ...	Tyalgum	28 May, '15.
" ...	Royal Preel ...	Itchen Royal ...	Hayes' Lily du Preel (imp.).	Murwillumbah ...	30 Aug., '15.
" ...	Alexander the Great.	Claudius (imp.)	Alexandrina of Richmond.	Frederickton ...	25 Mar. '15.
Ayrshire ...	Dan of the Roses	Daniel of Auchenbrain (imp.).	Ripple Rose...	Grafton Farm ...	*
" ...	Wyllieland Bright Lad (imp.)	Wyllieland Gleniffer (7229)	Wyllieland Sangie	Glen Innes Farm..	*
" ...	Isabel's Majestic	Majestic of Oakbank.	Isabel of Gleneira.	Grafton Farm ...	‖
Kerry... ...	Castle Lough Ranger (imp.)	Waterville Rover	Castle Lough Lizzie.	Bathurst Farm ...	*

*Available for service only at the Farm where stationed. † Available for lease or for service at the Farm where stationed.
‖ Available for special service where stationed upon application to the Under Secretary.

AGRICULTURAL SOCIETIES' SHOWS.

SECRETARIES are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 21st of the month previous to issue. Alteration of dates should be notified at once.

1915.

Society.	Secretary.	Date
Bathurst A., H., and P. Association	S. V. Turrell ..	Apr. 14, 15, 16
Hunter River A. and H. Association (West Maitland)	E. H. Fountain ...	,, 14,15,16,17
Tamworth P. and A. Association	J. R. Wood ...	,, 20, 21
Richmond River A., H., and P. Society (Casino) ...	D. S. Rayner ...	,, 21, 22
Upper Manning A. and H. Association (Wingham) ..	D. Stewart ...	,, 21, 22
Orange A. and P. Association	W. J. I. Nancarrow	,, 21, 22, 23
Barraba P., A., and H. Association	F. M. Cheesbrough	,, 27, 28
Wellington P., A., and H. Society	A. E. Rotton ...	,, 27, 28
Dungog A. and H. Association...	C. E. Prout ...	,, 28, 29
Nyngan P. and A. Association...	E. W. Costelloe ...	,, 28, 29
Murrurundi Poultry P. and K. Club	P. Webb	,, 30, May 1
Dubbo P., A., and H. Association	F. Weston ...	May 5, 6
Clarence P. and A. Society (Grafton)	G. N. Small ...	,, 5, 6, 7
Hawkesbury District A. Association (Windsor) ...	H. S. Johnston ...	,, 7, 8
Lower Clarence A. Society (Maclean)	J. McPherson ..	,, 11, 12
Coonamble P. and A. Association	J. C. Wilson ...	,, 12, 13
Trangie P., A., and H. Association	A. K. Butler ...	,, 19, 20
Peak Hill P., A., and H. Association...	A. Yeo	July 28, 29
National A. and I. Assn. of Queensland (Brisbane)...	J. Bain	Aug. 9 14
Narandera P. and A. Association	H. S. Robinson ...	,, 10, 11
Gunnedah P., A., and H. Association	M. C. Tweedie ...	,, 24, 25
Murrumbidgee P. and A. Association (Wagga) ..	A. F. D. White ...	,, 24, 25, 26
Parkes P., A., and H. Association	G. W. Seaborn ...	,, 25, 26
Ariah Park P., A., H., and I. Association	J. E. Rowston ...	Aug. 31, Sept. 1
Narrabri P., A., and H. Society	D. J. Bridge ...	Aug. 31, Sept. 1, 2
Manildra P. and A. Association	A. Anderson ...	Sept. 1
Albury and Border P., A., and H. Society	W. I. Johnson ...	,, 7, 8, 9
Young P. and A. Association	T. A. Tester ..	,, 7, 8, 9
Cowra P., A., and H. Association	E. W. Warren ...	,, 14, 15
Cootamundra A., P., H., and I. Association	T. Williams ...	,, 14, 15
Canowindra P., A., and H. Association	G. Newman ...	,, 21, 22
Temora P., A., H., and I. Association	A. D. Ness ...	,, 21, 22, 23
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Yass P. and A. Association	E. A. Hickey ...	,, 29, 30
Tweed River A. Society (Murwillumbah)	A. E. Budd ...	Nov. 10, 11

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Agricultural Gazette of New South Wales.

The Butter Industry.

[Continued from page 286.]

M. A. O'CALLAGHAN.

Neutralisation and Pasteurisation of Cream as regards the Quality of Butter.

THERE is quite a lot of inexperienced and untrained opinion floating about the dairy atmosphere concerning the improvement which may be brought about in the butter manufactured from second and third class creams when these have been treated with sodium bi-carbonate and afterwards pasteurised. Under the circumstances, it will be well to analyse the position pretty fully.

High-class Sweet Cream.

A cream which is absolutely clean in flavour and sweet does not require to be neutralised, and does not require the addition of any foreign substance in order to manufacture therefrom, with the aid of pasteurisation and proper ripening afterwards by a first-class starter, the best butter that it is possible to obtain from such cream. In such cases pasteurisation is of advantage only in adding to the keeping qualities of the butter, but this is a very great advantage indeed when we consider that our butter is, generally speaking, about two months old before it is placed before the British public for consumption.

Food-tainted Cream.

We will now take the next variety of cream, viz., a sweet cream that has been tainted by the foods which the cows consume. At certain seasons in the year the cream produced on farms on the Richmond and Tweed Rivers, as well as in other districts, suffers very considerably from food taints. If this cream were blended with other sweet cream, and a butter manufactured therefrom, the taint would have a depreciating effect, even though a great deal of such taint would be carried away in the butter-milk and afterwards dulled by freezing. When creams of this kind become acid, or are mixed with other creams that have developed a fair amount of acidity, and the bulk is neutralised by the addition of sodium bi-carbonate, the great aëration that takes place when such cream is heated by pasteurisation practically eliminates the food taints referred to, and consequently the butter manufactured is considerably superior to that which would have been made from such cream if it had not been neutralised and pasteurised. But it must be clearly pointed out that a cream of this character is not at all of an injurious nature from a health or chemical point of view. Its palatability is the only point adversely affected by the food flavours.

Fresh Cream with a slight Taint of Uncleanliness.

We will next take that class of cream which is delivered at the factory, containing very little acidity, but which has evidently not been produced under the cleanest conditions. The fault may lie in unclean cow-bails, in unclean methods of milking by hand, or in unclean milking machines. If such cream is delivered fresh to the factory it takes an expert cream grader to detect the unclean flavour, but if it is held over for a day putrefactive decomposition generally becomes very manifest. The farmer protects himself in such cases by delivering the cream sufficiently fresh to the factory to enable the factory manager to treat it in a proper manner, and to such creams undoubtedly neutralisation and pasteurisation are of a distinct advantage. These creams, of course, in the ordinary way of business, are mixed with creams containing a fair amount of acidity, and neutralisation is necessary before pasteurisation can be carried out in a thorough manner. The gas formed by the addition of sodium bi-carbonate to the cream splits up the cream into small particles in its endeavours to make an exit at the surface, and in doing this obnoxious gases that have been formed by bacterial decomposition are removed. Thus the cream is purified of these foul tainting gases, and by the action of heat during pasteurisation the germs that caused those foul taints are, practically speaking, all destroyed. The position is now a very satisfactory one, because it will be borne in mind that these bacterially tainted creams were delivered in a fairly fresh state, and before any quantity of those substances peculiar to putrefactive decomposition could have been formed. Therefore, from a health, as well as from a commercial point of view, matters have been improved.

Somewhat over-ripe Cream.

We will next take that class of cream which is delivered over-ripe at the butter factory. Cream of this kind is usually sent to the factory every second day, and when it arrives it is affected with a mixed fermentation. If dairying operations have been carried out under pretty good conditions, lactic fermentation will predominate, and the cream will not be badly tainted, but there will be evidence of the action of unfriendly bacteria. Cream of this kind, if not mixed with better cream, would turn out a butter worth, say, 88 points. A butter of this character is fairly palatable to eat while fresh, but, unfortunately, it lacks keeping qualities. This is a legitimate cream to "doctor" by the assistance of a neutralising agent before pasteurisation, because there is nothing in such cream, nor in the butter which would have been made from such cream, injurious to the public health, and a benefit rather than otherwise is conferred on the consumers by neutralising and pasteurising same before making into butter. Sometimes in summer cream of this character, though only two days old, arrives at the factory in what is called a "fermented" condition, owing to the action of gas-forming bacteria, hastened by heat. Such cream may not, apart from the gas formed, contain any very injurious products, and unless there is a manifestly foul taint there appears no reason why such

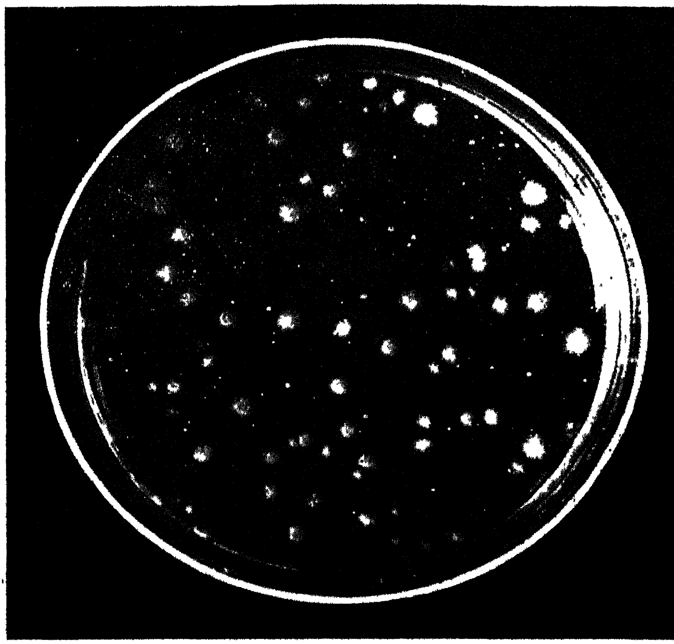


Plate A.—An unclean cream, contaminated by the putrefactive germ ***Proteus vulgaris.***

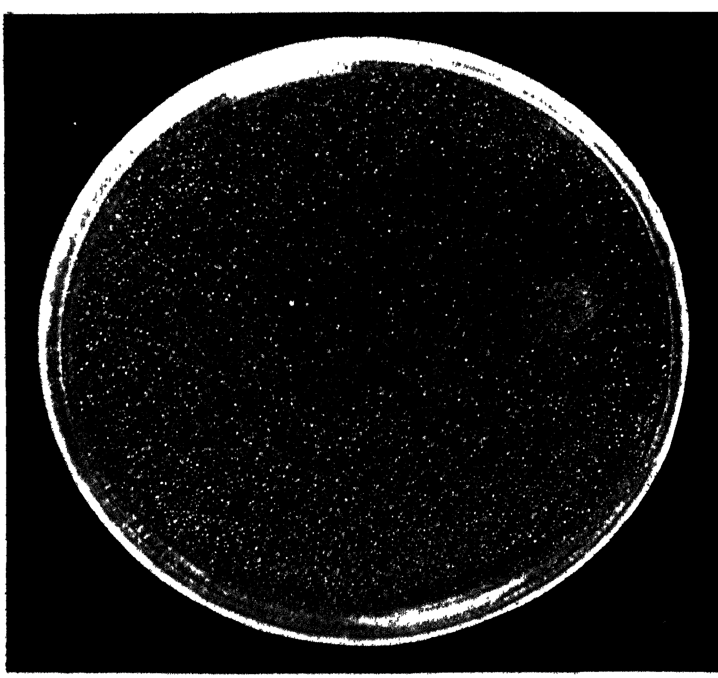


Plate B.—Showing the bacteriological condition of an extremely unclean cream which was not very old.

THE BUTTER INDUSTRY.

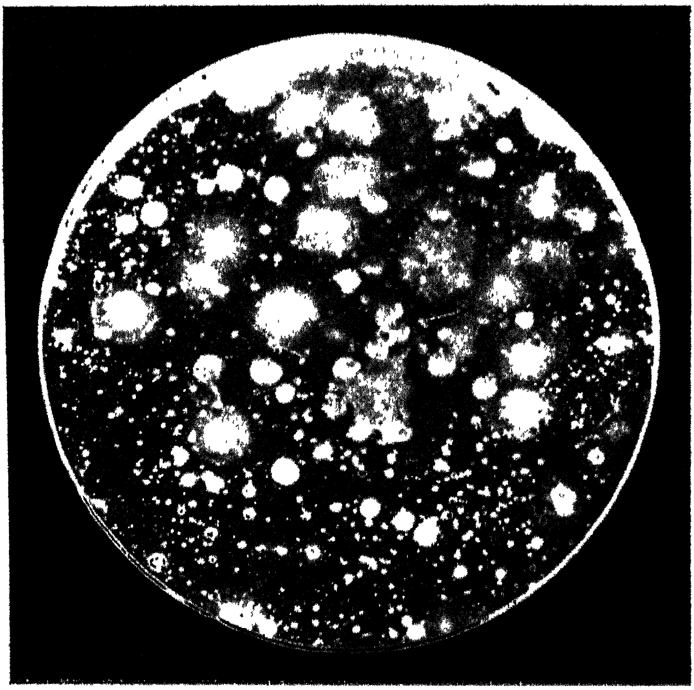


Plate C.—Showing a plate culture from a cream badly contaminated with the mould *Oïdium lactis* and other injurious germs.

THE BUTTER INDUSTRY.

creams should not be neutralised and pasteurised, assuming, of course, that they are not more than two days old.

Cream Suffering from Advanced Putrefactive Decomposition.

It is with regard to cream of this kind that the public health question it raised. Under the Pure Food Act this is contaminated food, and should not be manufactured into butter. However, it is not possible to have an inspector in each butter factory daily, and consequently such cream is received and manufactured into butter at a number of factories in the State as a regular part of the business. The quantity of such cream increases considerably during the late autumn, winter, and early spring months, when the export of butter has ceased, and when the quantity of cream produced on the farms is so small that the farmer does not consider it worth his while to send it to the factory more frequently than once or twice a week. In fact, I saw cream last winter that was a fortnight old when delivered at the factory. Needless to say, it was totally unfit for the manufacture of butter. Now, there are grave reasons why cream of the kind described should not be neutralised, pasteurised, or, in fact, received at the factory at all. Taking a health point of view first—though, by the aid of a neutralising agent, or by aëration as the result of same, and by pasteurisation, it would be possible to manufacture butter from such cream, provided some other cream not so bad was blended with it, which would pass muster for table purposes—in creams so affected it is almost certain that poisonous products have been formed as the result of advanced decomposition of the albumenoids. By freeing the foul gases we get rid of the smell which enabled us to detect that the food had suffered from decomposition, and by heating to a certain temperature we will give the butter made from such cream some keeping quality, and by the action of heat we may also have destroyed some of the poisonous matters formed by the advanced putrefactive decomposition. Are we justified in offering to the public this food in which injurious products, from a health point of view, are hidden? There can be but one reply.

Let us consider the case of meat suffering from manifest putrefactive decomposition. Supposing that, by cutting this into small pieces and treating it so that the foul smell would be removed, would we be justified in offering it for human consumption, for instance, in the shape of sausage meat, or who, knowing that the food had been so treated, would think of eating it? The cases are parallel ones to a very great extent, the chief difference being that butter, after being thoroughly washed, contains only about 1 per cent. nitrogenous matter, and, consequently, the dangers, from a health point of view, would be greatly minimised in the case of the butter compared with that of the meat.

Another very grave reason why it would be inadvisable to treat such cream viz., by receiving and improving same, the factory is simply putting a premium on uncleanly, slovenly, and careless conditions of dairying, and there could be but one result of such a condition of things, viz., a general

lowering of the quality of the cream supplied to factories, and consequently a general lowering of the quality of our butter.

Probably the best way to treat this question of neutralisation would be to grant a permit to all factories to neutralise creams not below a certain standard, and if it was found that managers treated foul creams of the kind described, the permit should be withdrawn.

Technique of Neutralisation.

Provided the cream shows more than 0·25 per cent. of acid, it is advisable to neutralise same down to something below 0·2 per cent., but the greatest care must be taken that the cream is not made alkaline. In other words, all the acid should not be neutralised on any account, as the action of alkalies on albumens is such that the health authorities may justifiably object to the use of a neutralising agent unless they are guaranteed that the cream will not be rendered alkaline. The neutralising agent does not have its full effect until after the cream has been heated and mixed in the vat; this is the best time to take the acidity test to see to what standard of acidity the cream has been reduced.

Temperature for Pasteurising.

Pasteurisation is the application of heat to liquids for the purpose of destroying the germs that are growing therein, but no pretence is made towards entirely destroying the seeds of these germs. On the other hand, if the heat applied is such that it will either totally or partially destroy a high percentage of the germ seeds as well as the germs, then it goes as a matter of course that the cream will be in a better condition to be a suitable ground for the starter to operate on and produce the desirable flavour required. Under these circumstances it will be seen that the actual temperature necessary to use will depend to a great extent on the bacteriological condition of the cream. If the cream is two or three days old a number of spores or seeds of highly resistant bacteria would have been formed, and, therefore, in order to destroy a high proportion thereof, a greater heat will be required than would be necessary in the case of cream, say, one day or twelve hours old, because, in the case of a cream of this kind, the number of spores or seeds formed would be comparatively small. Hence it will be seen that in dealing with over-ripe cream that has been neutralised it is advisable to use a higher temperature than is necessary in the case of a sweet cream, and I have employed a temperature of 185 degrees Fah. with marked success in the case of over-ripe cream. For creams one day old, however, unless they are particularly bad ones, a temperature of 175 degrees Fah. will be quite high enough. In giving these temperatures it is assumed that the class of pasteuriser used is the ordinary quick pasteurising machine which does not arrange to allow the cream to remain above the bacterial death point for any length of time. I have suggested to certain factories that it would be advisable to have a small vat in which to allow the cream to flow from the pasteurising plant before it would be pumped to the cooler. This has a double advantage, viz., the cream is held at a higher temperature

Plate D.—Made from mixed cream after pasteurising had been completed.

Creams A, B, C, and others were included in the bulk that was pasteurised.

The large colony near the centre is that of a mould, and is probably due to accidental contamination.

The cleansing power of the pasteurising is here illustrated.

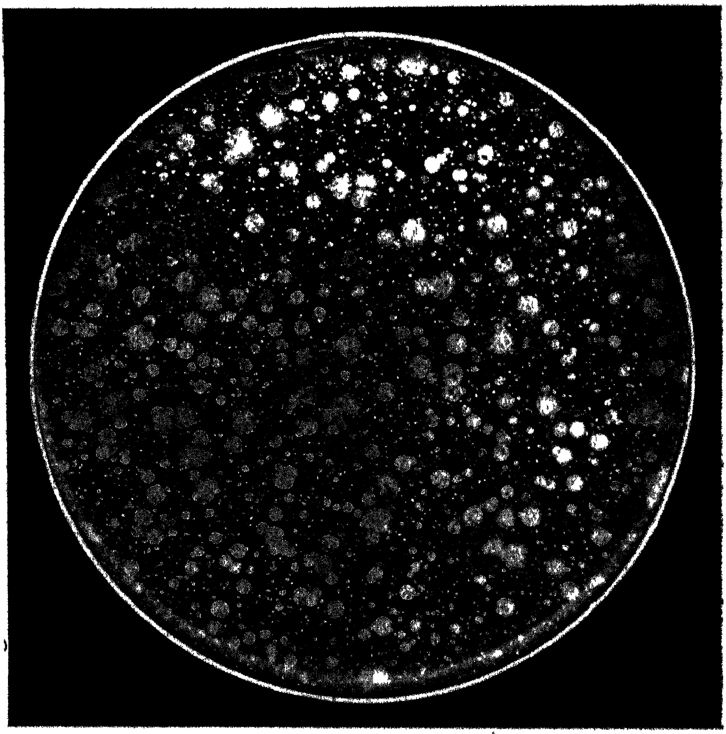


Plate E.—Representing a sample of cream that was classed as manifestly putrefactive.

This cream was too bad to pasteurise or use for butter-making for table purposes.

The germs *B. Proteus vulgaris*, *B. fluorescens liquefaciens*, *Lactis aërogenes*, are all well represented.

The cream was about three days old, and had a foul odour.

THE BUTTER INDUSTRY.

for a few minutes; and also, owing to the temperature being maintained, the aëration of the cream, through the action of the gas formed by adding bi-carbonate of soda, proceeds for a very much longer time than if the cream was cooled immediately after heating. Under these conditions it would never be necessary to raise the temperature above 175 degrees Fah. When a regenerative pasteuriser is used the cream leaves the pasteurising plant at, say, 135 degrees Fah., and this is well above the death-point of nearly all bacteria; hence a delay of ten minutes, even at this temperature, aids in the destruction of germ life.

Starter required.

A factory manager said to me recently: "Anybody can pasteurise cream—the machine does that; the whole difficulty consists in the making of the starter and in the proper ripening of the cream after pasteurisation." From my experience, this sums up the situation pretty accurately. There is no sense whatever in destroying injurious germs in cream if other injurious germs are to be added, and, unless the starter employed is a first-class one, it is certain that a large number of injurious germs will be introduced into the pasteurised cream. Therefore, the operator must have a very sound knowledge of starters, and when they are fit to use, and otherwise. He should be capable of noticing the slightest contamination in the starter, and on such occasions a fresh starter should immediately be procured. Failing a fresh starter, a can or two of the very best cream delivered should be selected and used for the purpose.

Percentage of Starter required.

When sour cream is pasteurised the percentage of starter required is much less than when perfectly sweet cream has been treated. The reason for this is that the acid produced before the pasteurisation has already acted on the serum of the cream, and consequently the ripening effects, as far as making the cream easy to churn is concerned, have been produced. What the butter-maker is after, however, is an improved flavour, and in order to obtain this it is necessary that a good vigorous lactic fermentation shall be introduced into the cream, and hence the germs responsible for the production of this fermentation will also have passed into the butter and have acted as a protecting agent there to a certain extent. From what has been said it will be seen that sour cream that has been neutralised and pasteurised may be churned immediately after cooling and blending if absolutely necessary; but if a first-class flavour is desired it would be well to allow the cream to stand over until next morning, and add anything from 1 per cent. to 3 per cent. of starter, according to the season of the year. Churning may begin immediately it is seen that the starter is forming acid; in other words, when the cream shows a somewhat higher percentage of acidity than was evident soon after pasteurisation. I have got very good results with an acidity as low as 0·25 per cent., whereas, as may be seen by the Albion Park experiments, we had most excellent results with a cream showing 0·4 per cent. of lactic acid.

How to make a Starter.

During the last five or six years a number of people who have attended dairy science schools have been shown how to make a starter, but, while there is nothing in the making of a starter, there is quite a lot of knowledge required to know when the starter is actually first-class, or otherwise. If a quantity of freshly separated milk is obtained and heated to a temperature of, say, 185 degrees, and kept at that temperature for half an hour, then cooled to 90 degrees, and about 10 per cent. of lactic ferment added, the first necessary steps will have been taken. After the culture has been stirred in the milk should not again be interfered with until it has been coagulated, which should take place in anything from twelve to twenty-four hours, according to the temperature and the time of the year. While the starter is developing it is advisable not to allow the temperature to fall below 65 degrees Fah., otherwise contamination becomes fairly easy, through possible spores, moulds, &c., developing at temperatures too low for the lactic acid producing germs to grow rapidly. Having obtained a suitable first transfer from the original lactic ferment, the next day's transfer will require only about 5 per cent. of mother starter added to it, as the germs will now be getting far more vigorous than when sent from the laboratory. The same procedure may now be followed daily, and, if the factory manager has made proper arrangements for the cultivation of starters, he should be able to carry on without renewing the ferment for a couple of months. The surface of the starter should be skimmed each day with a sterilized vessel before use. This helps to avoid contamination.

Substitute for Skimmed Milk.

I find that the biggest question with many of our factories is the difficulty of providing a sufficient supply of skimmed milk. I have recommended the use of a fairly thin and perfectly sweet cream in the absence of skimmed milk. This cream should be pasteurised and treated in exactly the same way as skimmed milk, but it must not be more than a few hours old when delivered at the factory, otherwise it will not be possible to reduce the germ life sufficiently to make it a suitable basis for a starter.

When at Byron Bay recently I experimented with dried milk as a basis for starter cultivation, and had most satisfactory results. The idea of using dried milk was first suggested to me by the late Mr. Brandon, and only that there is more of a cooked taste in the starter thus produced than in the case where ordinary skimmed milk is used, there is really no other difference in the starters produced. This cooked flavour does not matter in the slightest, as only 1 to 3 per cent. of the starter would be used in the cream, and when the butter is washed this disappears. Consequently, I can recommend the use of dried milk to factories as a substitute for skimmed milk for the purpose of growing starters. The dried milk has one advantage over skimmed milk, viz., that it is already sterile, and it is only necessary to sterilise the water in which it is used. I find that by taking 10 per cent.

of dried milk a very acceptable basis for starter is produced. This should be added to water at a temperature of not more than 120 degrees Fah., then mixed with it and heated slowly up to a temperature of about 185 degrees Fah., so as to destroy any germs that are in the water. Needless to say, only the cleanest water should be used. Condensed water from steam boilers is not suitable, as this usually has a very definite and objectionable flavour.

Those factory directors and managers who propose erecting pasteurising plants during the forthcoming winter may have the services of the departmental staff for the purpose of giving information in connection with any of the points mentioned. I might add that we have at least three members of the staff who had experience in the pasteurisation of milk and cream more than twenty years ago.

The attached table showing the result of the Albion Park experiments should prove of considerable interest to butter-makers. The actual manufacture of the butter was supervised by Mr. G. Stening, who also took an active part in doing the neutralisation and pasteurisation under my supervision. The quality of the butter, from a manufacturing point of view, was far above the average, and this was a matter of comment by the various merchants who inspected the butters. For the improvement over ordinary manufacture on this head credit should go to the man who supervised the manufacture, viz., Mr. Stening.

Details of Experiments.

The experiments were carried out at the Dairy School at the Illawarra Central Co-operative Dairy Company, Albion Park, commencing on Monday, 31st August, 1914.

Experiment No. 1.—A quantity (about 35 gallons) of very inferior cream was taken and treated. Acidity of cream prior to neutralisation, 0·33 per cent. lactic acid. Neutralised with sodium carbonate to 0·15 per cent. acidity. Pasteurised to 174 degrees Fah., and cooled to 82 degrees Fah. over water cooler; 2½ per cent. lactic starter added, and allowed to remain till next morning, when it was churned.

Churning acidity, 0·37 per cent. Churning temperature, 51 degrees Fah. Temperature of wash water, 49 degrees Fah. Cream broke into butter in twenty-five minutes.

Sample box of butter marked BA, examined five weeks after manufacture, scored 40 points for flavour. Control box of butter manufactured from similar cream untreated in the ordinary way by the factory marked BE, scored on same date 35½ points for flavour.

Experiment No. 2.—Date, 3rd September, 1914. Some mixed ordinary cream of the factory was taken, grading about 88 points in the bulk, and treated. Acidity of cream, 0·4 per cent.; neutralised with carbonate of lime to 0·27 per cent. acidity; pasteurised to 190 degrees Fah., and cooled to 86 degrees. This cream contained no manifestly unclean lots. Two and a half per cent. lactic starter, propagated from good lactic cream, was added.

Churning acidity, 0·4 per cent; churning temperature, 48 degrees Fah.; temperature of wash water, 50 degrees Fah. Cream broke in twenty minutes.

Sample box marked BC scored 43 points for flavour on 8th October, 1914.

Experiment No. 3.—Similar quality cream to No. 2 was taken and treated with soda. Acidity of cream, 0·4 per cent.; neutralised with sodium bicarbonate to 0·22 per cent. acidity. Pasteurised up to 190 degrees Fah., and cooled over water cooler to 90 degrees Fah.; 2½ per cent. starter added.

Churning acidity, 0·31 per cent.; churning temperature, 51 degrees Fah.; temperature of wash water, 47 degrees Fah. Cream broke in thirty minutes. Sample box marked BD, on 8th October, 1914, scored 42 points.

A control box of butter was taken from the ordinary first grade manufacture of the factory (the cream being of similar quality to that used in Experiments No. 2 and 3), and marked BB. Graded 38½ points on 8th October.

Experiment No. 4.—About 100 gallons of cream; grading according to our standard (38 to 39 points for flavour) was taken, bulked, and thoroughly mixed in a cream vat. As nearly as possible this quantity was divided into three equal parts.

Portion A was pasteurised only and not neutralised. Acidity, 0·34 per cent.; pasteurised to 176 degrees Fah., and cooled to 86 degrees; 2½ per cent. starter added.

Churning acidity, 42 per cent.; churning temperature, 50 degrees Fah.; temperature of wash water, 46 degrees Fah. Broke in seventeen minutes. Sample box marked BF scored 41 points on 8th October, 1914.

Portion B was neutralised with sodium carbonate and pasteurised. Acidity of cream prior to neutralising, 0·34 per cent.; neutralised with sodium carbonate to 0·19 per cent. acidity; pasteurised at from 170 degrees to 174 degrees Fah., and cooled to 90 degrees Fah.; 3 per cent. starter added.

Churning acidity, 0·42 per cent.; churning temperature, 50 degrees Fah.; temperature of wash water, 46 degrees Fah. Broke in twenty-three minutes. Sample box marked BG graded 42 points for flavour.

Portion C was untreated, but 2½ per cent. starter was added to assist ripening.

Churning acidity, 0·42 per cent.; churning temperature, 53 degrees Fah.; temperature of wash water, 46 degrees Fah. Broke in twenty-two minutes. Sample box marked BH graded 37½ points on 8th October, 1914.

Mr. Stening states:—

"In giving the details of the manufacturing process it should be pointed out that the methods employed were as nearly alike in each churning as it was possible to obtain. The temperatures, however, show a variation, but this could not well be obviated owing to the lack of facilities for handling small quantities.

"The wash water was added at the moment the glass showed the slightest clearance, and in such quantity as would assist in the churning of an even and regular grain. The churning then proceeded until the grain was sufficiently large as to permit of easy drainage of butter-milk.

"After drawing off the butter-milk the butter was well washed twice; 2½ per cent. of salt was used, but no other preservative, and the working continued for six minutes."

This final experiment showed that though neutralisation improved the resulting butter, a very marked improvement was shown in the butter made from cream pasteurised only. These butters were held in store at a temperature not above 20 degrees Fah. After examination above referred to, the butters were held in store for a further month. The pasteurised samples showed very little, if any, deterioration, while the untreated samples had become rancid. None of the pasteurised butters showed any trace of fishiness, whereas samples marked BE and BB went quite fishy. This dissipates an idea prevalent in some quarters that butter made from cream showing more than 0·3 per cent. of acid will go fishy on being held.

The percentage of water in the various samples ranged from 13·39 to 15·38 per cent.

WATER REQUIREMENTS OF PLANTS.

FOR some years the United States Department of Agriculture has been making careful measurements to ascertain the relative water requirements of plants, the object being primarily to discover which plants are most economical in their use of soil moisture. An article has now been published by Drs. Briggs and Shantz summarising the results of the experiments, and in their tables wide differences are shown between the ability of various plants to produce a crop with a limited water supply. Thus, a millet known in America as Kursk millet was found to require 265 lb. of water for every pound of dry millet produced, while yellow-flowered alfalfa (lucerne) required 865 lb. for every pound of dry lucerne produced.

The more important results may be summarised in the following form:—To produce 1 lb. of dry matter, millets required from 265 lb. for Kursk to 444 lb. for Turkestan; maize required from 315 lb. for Esperanza to 413 lb. for China White; sorghums required from 285 lb. for Dwarf Kaffir to 344 lb. for Dwarf Milo, while Sudan grass stood at 467 lb.; wheats required from 473 lb., for Turkey to 559 lb. for Marvel Blue-stem; barleys required from 502 lb. for Hannchen to 556 lb. for White Hull-less; oats required from 559 lb. for Canadian to 622 lb. for Sixty-day; spring rye required 685 lb.; sugar beet (one variety) 397 lb., and Irish Cobbler potato 554 lb.; crucifers required from 539 lb. for Wakefield cabbage to 743 lb. for rape; cucurbits required from 600 lb. for Rocky Ford watermelon to 713 lb. for Boston pickling cucumber; legumes required 571 lb. for cow-peas, 770 lb. for sweet clover, 775 lb. for Canada field pea, 690 lb. for hairy vetch, and 789 lb. for red clover; lucerne required from 651 lb. for Peruvian to 865 lb. for yellow-flowered alfalfa.

Prices of Wheat and Equivalent Prices of Manufactured Products.

JOHN B. TRIVETT, Government Statistician.

In view of the considerable complexity surrounding this question, and the many confusing statements given by witnesses during the investigation of the price of flour and of bran and pollard by the Necessary Commodities Control Commission, it has been considered desirable to make an examination into the whole matter of milling charges attaching to the production and distribution of flour and wheat products.

With this object, I have taken the opportunity in the first place of witnessing the whole operations at the mill, from the wheat-sack to the flour-sack, which I have been enabled to see by the courtesy of one of the metropolitan millers, who showed me every stage of the flour milling process.

I also obtained from eight of the largest millers of the State (five in the city of Sydney and three in the country districts) a complete statement for each mill of the charges for gristing and of other costs up to the stage of delivery into the dray at the mill gate.

By these means basic information has been derived which should be of considerable interest and value.

For obvious reasons, neither the individual names of millers nor details of their mills are given, since the figures with which they have supplied me contain a record of the whole of their operations for a period of one year, both as to quantities and prices in relation to each itemised activity of their business, and, following the usual statistical rule, the individual confidence must be maintained unbroken.

In the figures quoted I have omitted those relating to country millers, which comprise about one-sixth in volume of those tendered to me, because the conditions are different in nearly every respect to those obtaining in the city.

The following are the salient features of the figures supplied to me respecting the manufacture and sale of flour in the metropolis.

The returns now under discussion related to 5,296,457 bushels of wheat which were bought and delivered at mills for £977,218, or at an average price of 3s. 8·8d. per bushel, and from which 111,978 tons of flour were produced. The following table gives the massed cost arising from the various operations

during milling and business charges attaching to the selling of the product of the five city mills :—

	Total Cost.	Cost per ton of Flour produced.		
	£	£	s.	d.
Gristing—				
Mill wages, bags, repairs, maintenance, fuel, and other materials	67,998	0	12	1·73
Other Charges of Production—				
Rent, stacking, rates, fire and accident assurance, interest, depreciation ...	34,161	0	6	1·22
Selling Charges—				
Discount and exchange, stamps, stationery, advertising, commission, law, salaries, travelling, bad debts, and other ...	42,404	0	7	6·89
Total cost of milling and selling	£144,563	£1	5	9·84

I have endeavoured to find out what proportion can be fairly allowed for waste in the gross bushels purchased by the miller, and to do this have accepted, under their own definition, the figures for clean and uncleaned wheat, which give the following statement :—

Uncleaned Wheat.—39,312 tons of flour were obtained from 1,893,865 bushels of wheat, or an average of 48·175 bushels of wheat per ton of flour produced.

Cleaned Wheat.—72,666 tons of flour were obtained from 3,402,592 bushels of wheat, or an average of 46·825 bushels of wheat per ton of flour produced.

Hence we get the following consideration :—

Uncleaned wheat	48·175	bushels per ton.
Cleaned wheat...	46·825	„ „
Waste	1·350	„ „

This waste is equivalent to 2·8 per cent.

Using the above figures, and assuming the average weight for uncleaned wheat at 60 lb. per bushel, we have the following results :—

		lb.
48·175 bushels at 60 lb. per bushel ...	=	2,890·5
Waste at 2·8 per cent.	=	80·9
Net weight of products	=	2,809·6
Of which flour is		2,000
Offal (bran and pollard, &c.)	=	809·6

Whence I assume that with every ton of flour produced there is available as offal 810 lb., and the rest, viz., 81 lb., must be written off as waste, which may or may not provide some small monetary advantage.

Having thus cleared the groundwork, I have calculated tables which should prove useful, showing the prices per ton at which flour can be manufactured, assuming stated prices of wheat per bushel, and of offal (bran and pollard) per ton. This gives the actual cost of the flour, without any allowance for delivery charges and profit.

As approximately 48 bushels of wheat are required to produce 1 ton of flour, it is obvious that an additional 4s. per ton must be charged for every extra 1d. in the price paid for wheat. Also, as 810 lb. of offal are obtained for every ton of flour, or slightly over two-fifths of a ton, it follows that every additional 10s. per ton in the price of offal means an extra 4s. for every ton of flour produced. In other words, with flour at the same price, an increase of 10s. per ton in the price of offal enables a miller to give an extra penny per bushel for his wheat.

The following table gives the figures at which flour can be sold when wheat is bought at various prices, and conditional on the stated rates for offal being obtained. The corresponding figures for any intermediate price per bushel of wheat or ton of offal can be easily calculated.

Price at Mill, Sydney, at which Flour can be Manufactured, with Wheat and Offal at stated prices.

This does not allow for profit, but is the actual cost.

Assumed 48·175 bushels of wheat = 1 ton (2,000 lb.) of flour and 810 lb. (effective) offal.

Price of Wheat per bushel.	Offal at per ton.			
	£4 10s.	£5 10s.	£6 10s.	£7 10s.
s. d.	per ton. £ s. d.	per ton. £ s. d.	per ton. £ s. d.	per ton. £ s. d.
3 6	7 18 0	7 9 10	7 1 9	....
3 9	8 10 1	8 1 11	7 13 10	....
4 0	9 2 1	8 13 11	8 5 10	7 17 9
4 3	9 14 2	9 6 0	8 17 11	8 9 10
4 6	10 6 2	9 18 0	9 9 11	9 1 10
4 9	10 18 3	10 10 1	10 2 0	9 13 11
5 0	11 10 3	11 2 1	10 14 0	10 5 11
5 3	12 2 4	11 14 2	11 6 1	10 18 0
5 6	12 14 5	12 6 3	11 18 2	11 10 1
5 9	13 6 5	12 18 3	12 10 2	12 2 1
6 0	13 18 6	13 10 4	13 2 3	12 14 2
6 3	14 10 6	14 2 4	13 14 3	13 6 2
6 6	15 2 7	14 14 5	14 6 4	13 18 3
6 9	15 14 7	15 6 5	14 18 4	14 10 3
7 0	16 6 8	15 18 6	15 10 5	15 2 4

Harvest Reports, 1914-15.

GLEN INNES EXPERIMENT FARM.

R. H. GENNYS, Manager.

THE harvest this year was concluded sooner in the season than usual, partly owing to the delays from rainy weather not being so protracted as during several previous seasons.

There were no late frosts to interfere with the various crops, but these must be kept in view so as not to sow early maturing crops too early. The long-maturing varieties may be sown as early as April, but such wheats as Florence and Thew, intended for grain, should not be planted before June in New England, and may be sown as late as July and have a good chance.

Oats.

This is the oat-breeding station of the Department, inasmuch as oats is the main crop of the district. Our largest areas were sown with Algerian The 54 acres cut for hay yielded about $2\frac{1}{4}$ tons to the acre, while the 71 acres left for grain yielded 44 bushels per acre. White Tartarian yielded 42 bushels to the acre from 20 acres.

In smaller areas of from half an acre to 1 acre the following gave returns as follow:—

Guyra (Algerian x White Ligowo) ...	57 bushels per acre.
Brown Calcutta	54 " "
Ruakura	45 " "
Sunrise...	48 " "
Abundance	40 " "
Big Four	24 " "
Hutchinson's Potato (oat)	36 " "

All the foregoing, with the exception of Big Four, are suitable for the Northern Tableland.

White Tartarian is a profitable oat in the Glen Innes district as a hay-yielder for chaffing, but is somewhat smut-liable. A new strain of White Tartarian, which is free this year, is the only one now being kept here and sold for seed.

Wheats.

Haynes' Blue Stem grew a fine tall crop, which would have given a splendid hay return, thus keeping up its high reputation in this respect. The crop, however, was cut for grain for seed purposes, and yielded 28 bushels to the acre.

Genoa over several years has done exceptionally well, and seems peculiarly adapted to New England for producing grain and hay. This year an area of 10 acres gave 27 bushels to the acre. The check plots of Genoa throughout the numerous experiments more than held their own in almost every case. It is a good smut and frost resister.

Florence, of which there were 18 acres, is not quite comparable with Haynes' Blue Stem and Genoa this year, and it did well to yield 20 bushels under much more unfavourable conditions than the two others. It is a very early maturing and good all-round variety, being a great favourite in several parts of the State.

At present the foregoing have proved to be our three best varieties, and farmers here are strongly recommended to give them a trial; those that have done so, in nearly every case, are well pleased.

Thew (27 acres) was also grown under more unfavourable conditions than either Haynes' Blue Stem or Genoa, and it cannot be considered to have done badly to produce 15 bushels to the acre, considering that it was sown in new ground, where the sod had not been turned long enough to be properly decomposed. It is chiefly a green-feed variety and a very early maturer. It is somewhat liable to smut, and I think Florence may well take its place in every respect, the latter being a good fodder sort and a fine smut resister.

There were 65 acres under wheat in all, averaging about 20 bushels to the acre. In the demonstration area the only manure used was superphosphate, and this farm believes in applying from 50 to 80 lb. per acre whenever the soil is on the poor side. Manures must be used in connection with proper soil working for the best results to be obtained.

Maize.

Although our maize crop of Early Yellow Dent is not yet gathered, the results can now be fairly forecasted at from 40 to 50 bushels per acre, as it is ripe. This variety is a fair yielder, and is valuable to us here on account of its early maturing qualities.

Potatoes.

The potato crop of several varieties is not yet gathered, though a fair quantity of tubers will be dug, yet the size must be small owing to being checked by the dry weather.

Surprise stands right out from the others, promising to be a great favourite. It has now done well with us for several years.

Queen of the Valley appears to be one of the next best, though far behind Surprise this year.

Taking the crops all round, our harvest may be considered to have been a most satisfactory one.

COONAMBLE EXPERIMENT FARM.

A. H. E. McDONALD, Manager.

In common with most of the wheat-growing areas of the State the rainfall in this district during the 1914 season was of a very unsatisfactory nature. During the autumn good rains had fallen, however, and by thorough fallowing a good reserve of moisture was conserved in the subsoil, and this, in addition to some light rains during the actual growing season, enabled us to obtain some really very excellent returns. Experience is constantly proving in the drier belts that when a substantial amount falls on carefully tended fallow land, the wheat grower is practically independent of any but light rains during the actual period of growth. It can now be almost taken for granted that when land has been well fallowed, and the subsoil is well filled with moisture at the commencement of the wheat-growing season, the farmer need have no fears regarding the crops.

The rainfall for the year 1914 was :—

January ...	0·55 inches.	August ...	Nil.
February ...	2·67 "	September ...	0·28 inches.
March ...	4·66 "	October ...	0·43 "
April ...	0·67 "	November ...	1·09 "
May	2·04 "	December ...	3·31 "
June	0·25 "		
July	0·98 "	Total ...	16·93 inches.

The Wheat Crops.

The soil in paddock No. 1, is a reddish clay loam. It is rather heavier than most wheat soils, and is inclined to run together after rain. For the 1914 crop it was ploughed in July and August of 1913, and worked with the spring-tooth cultivator in November, 1913. It was disc-cultivated in April, 1914. Portion was sown with wheat early in April, and the remainder early in May. In June the young crop was harrowed.

Firbank was sown early in April, but it did not do well with us. It does not seem to stand either cold or dry weather as well as some other varieties. The ears were all tipped to some extent, and although a light crop of grain could have been obtained, it was deemed advisable to cut it for hay, as there was a good growth of straw.

King's Early, Sunset and Florence were all sown early in May. These three sorts all did very well, the best being Sunset, which was a very nice even crop, and gave 18 bushels per acre. The varieties sown in May were almost ripe at the end of September, and, therefore, only had 3·55 inches of rain whilst growing. Those planted in April received 4·22 inches.

Federation gave a very good return. It is not altogether a suitable wheat for this district as the straw is very short, and it is better to have a variety which may be turned into hay if it fails for grain.

The Rymer in this paddock was sown too late for this district, owing to delay in receiving the seed, and it only made a short growth and did not ear well.

The soil in paddock No. 7 is typical of the black-soil plains. It was ploughed in July and August, 1913, and was worked twice with the spring-tooth cultivator in March and April after two heavy falls of rain.

Steinwedel and Rymer were sown early in April, and both did well, the best returns being obtained from Steinwedel; Rymer was tipped slightly. A later sowing of Rymer was made in May, but it did not ear well, as it is a slow grower and was affected by hot weather in the spring.

Firbank was largely sown, but it tipped badly and was cut for hay. In this paddock small beetles and their larvæ caused some damage among the early sown varieties by eating the seed. The late sown portions were not affected, as the seed germinated soon after it was sown.

The soil in paddock No. 10 is chiefly black with patches of red clay loam. It was ploughed in October, 1913, and worked with the spring-tooth cultivator in April. A fairly large area of Firbank was sown, and the ears were tipped as in the other paddocks. Rymer was sown, but, as in other paddocks, it suffered through being too late.

The Time to Sow.

It was intended to get a good deal of the sowing done late in March and early in April, but rain interfered, and, consequently, most of the land could not be sown before the beginning of May. It was considered that the early sown crops would have the best chance, as they would miss most of the hot weather in spring, and the season's experience justified this view. The season in this district appears to be at least a month earlier than in most wheat-growing districts. Frosts are almost over early in August, and about the middle of September hot winds are likely to occur, and the grain should be well filled by that time.

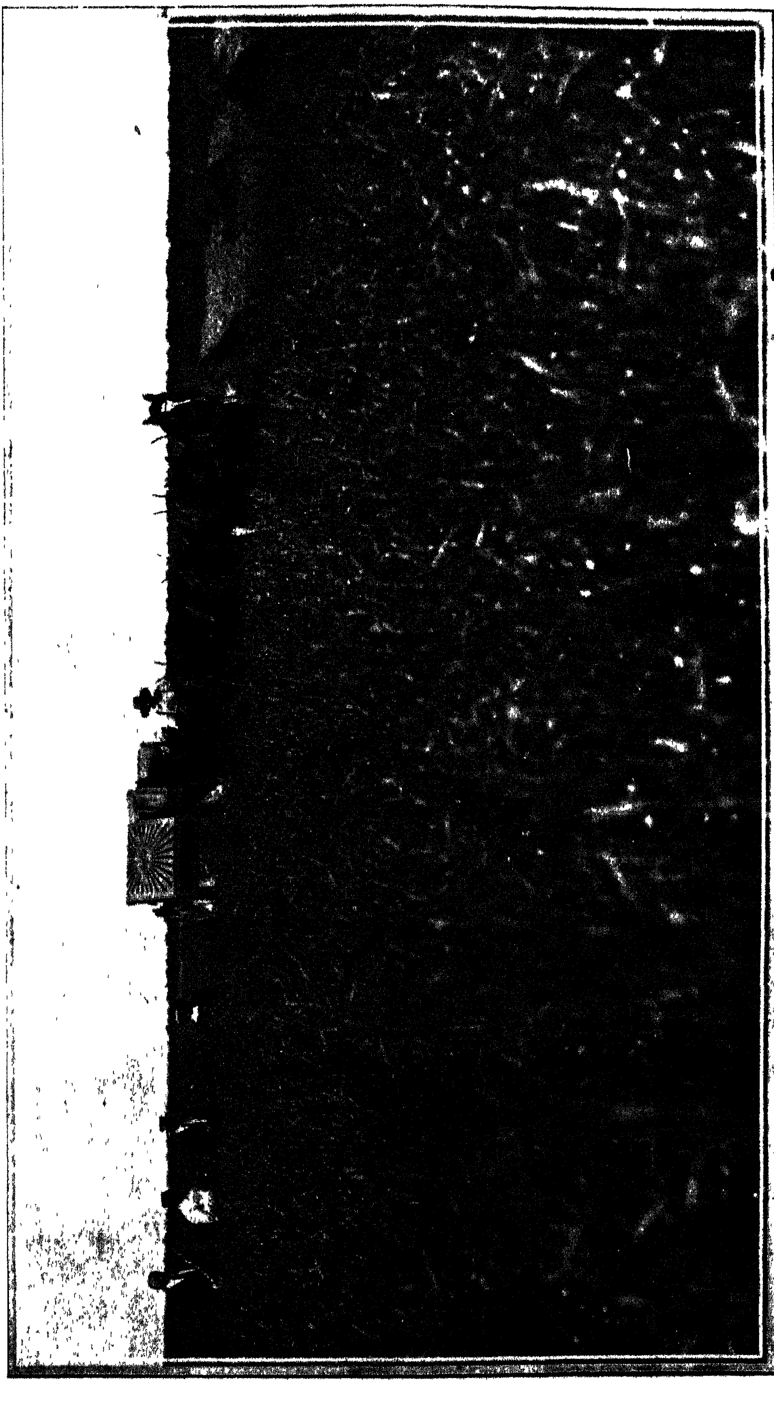
It seems, also, that fairly early wheats must be sown. Exceptionally early sorts, such as Sunset, should not be sown before the end of April or the beginning of May.

The accompanying tables show the returns from the various crops of wheat:—

PADDOCK No. 1. Reddish Clay Soil.

Variety.	Area cut for Grain.	Area cut for Hay.	Quantity of Seed per acre.	Date Sown.	Date Harvested.	Yield of Grain per acre	Yield of Hay per acre.
	acres.	acres	lb.			bus.	t. c. q.
Firbank	...	22½	80	10 April..	2 September	......	1 5 2
Federation ...	4	...	80	6 May...	19 October ...	15	.. ..
" ...	...	3½	80	6 " ...	28 September	......	1 0 0
King's Early ...	1¼	...	80	7 " ...	19 October ...	15	......
Sunset	1½	...	80	7 " ...	3 " ...	18	......
Rymer	...	6¼	30	7 " ...	28 September	......	0 18 2
Florence	3½	...	80	7 " ..	19 October ..	14	......

Fertiliser.—Half the block of Federation was treated with 56 lb. of superphosphate per acre. Unfortunately, galahs did great damage to this variety,



Crop of Steinwedel Wheat grown at Coonamble Experiment Farm.

Yield 24 bushels per acre. Rainfall during growth, 4·22 inches.

completely eating out large patches, and it was not possible to harvest the separate blocks satisfactorily. Judging by the growth, however, the fertiliser had very little effect. The yield of grain from Federation was estimated, but in all other cases the actual yields were obtained.

Total yield of hay from $32\frac{1}{5}$ acres, 37 tons 18 cwt. 2 qrs.; average, 1 ton 3 cwt. 3 qrs. per acre.

Average yield of wheat, 15 bushels per acre.

PADDOCK No. 7.—Black Soil.

Variety.	Area cut for Grain.	Area cut for Hay.	Quantity of Seed per acre.	Date Sown.	Date Harvested	Yield of Grain per acre.	Yield of Hay per acre.
	acres	acres.	lb.			bus.	t. c. q.
Rymer	5·4	...	40	2 April..	13 October ...	14	......
,, ...	...	13	40	2 ,, ...	8 September	......	2 0 0
Steinwedel ...	9·8	...	40	4 ,, ...	10 October ..	24	......
,, ...	...	5	40	4 ,, ...	8 September	.. ...	2 0 0
Firbank	...	2	35	6 ,, ...	27 August ...	......	1 10 0
,, ...	...	18	35	13 ,, ...	28 ,, ...	.. ...	1 15 0
,, (re-sown)	...	30	30	4 May...	10 September	......	1 6 0
Rymer	...	10·8	40	30 April..	24 ,, ..	......	1 0 0

Total yield of hay from 78·8 acres, 120 tons 10 cwt. 2 qrs.; average yield, 1 ton 10 cwt. 2 qrs. per acre.

Total yield of grain from 15·2 acres, 292 bushels; average yield, 19·2 bushels per acre.

No fertilisers were used.

PADDOCK No. 10.—Black Soil.

Variety.	Area cut for Hay.	Quantity of Seed per Acre.	Date sown.	Date harvested.	Yield of Hay per Acre.
	acres.	lb.			t. c. q.
Firbank	23½	30	24 April ...	16 Sept. ...	1 18 3
Rymer	11½	20	20 ,, ...	20 ,, ...	1 2 2

Total yield of hay from 352 acres, 58 tons 12 cwt. 1 qr.; average yield, 1 ton 13 cwt. 2 qrs. per acre.

In this paddock an area of 40 acres of stubble land was sown to Florence, and from 16 acres of this, sown on 7th May, a yield of only 10 tons of hay was obtained. The remainder was sown on 25th May, and a fairly thin growth was obtained, but it was destroyed by birds. This area of 40 acres was the only unfallowed land that was sown, and the result indicates how essential is fallowing in this district.

Other Crops.

In paddock No. 6 the soil is chiefly black. A crop of wheat was grown on it in 1913, and the plough was put in during December. In March, portion

was worked with the spring-tooth cultivator, and the remainder was harrowed. During March Cape barley was grown for silage, but eventually a portion was stripped for grain. An accompanying table shows the results obtained on this paddock.

Rape was sown on 25 acres, but the seed was destroyed by flooding, and the ground was then worked with the spring-tooth cultivator and sown with Cape barley.

Barley. All the early-sown barley in this paddock was thin, as a good deal of the seed was destroyed by flood waters.

About 45 acres of rape was sown, but much of it failed to germinate. Where it came up well it made very fair growth, but after May it was affected by the dry weather.

About 350 tons of barley silage was made in pits, and a good product was obtained. None of it was used, but it proved very valuable as about 800 hoggets were running on the farm, and towards the end of December grass became very scarce. The sheep were in very fair condition, and if the silage had not been available they would have been sent to market and would have returned not more than 11s. per head after paying expenses. Just as we were about to begin to feed them on the silage, however, good rain fell, and they at once became worth about 13s. per head on the farm.

Barley was also sown in a portion of No. 1 paddock on the 1st April. The varieties were Cape and Cowra No. 36. The early growth was very luxuriant, and in June both varieties were fed off with sheep when about 8 inches high. Practically no rain fell after this, and the crop made very poor growth. From 6·6 acres of Cape barley 21 bushels were harvested, and from an acre and one-third of Cowra No. 36, 7 bushels.

In No. 10 paddock a self-sown crop of Cape barley was grown. A crop of barley had been cut for silage in 1914, and the plants made a second growth, and some seed ripened. Early in February the land was worked with the disc-cultivator, and at the end of February heavy rain fell and a good stand was obtained. It was fed off twice during March and April. In August 24½ acres were cut for silage, 125 tons being obtained, or an average yield of 5 tons per acre. On 9th October, 5·4 acres were stripped for a yield of 121 bushels of grain, the average being 23·3 bushels per acre.

PADDOCK No. 6. Black Soil.

Variety.	Quantity of Seed per acre.	Area cut for Silage.	Area cut for Hay.	Area cut for Grain.	Date sown.	Date harvested.	Average Yield per acre.		
							Hay.	Grain.	Silage.
	lb.	acres.	acres.	acres.			t. c. q.	bus.	tons.
Cape barley	34⅔	50	...	...	10-17 Mar.	24 Aug....	......	...	4
"	34⅔	...	3	...	"	2 Sept. ..	1 6 0	...	...
"	34⅔	...	...	20	"	5 Oct. ...	......	14	...
"	40	...	13	...	1 May ...	23 Sept...	1 9 0	...	...

The barley sown on 1st May was on land where rape had been sown earlier, but the seed had been destroyed by flooding. The barley was cut just after earing, and the hay made into chaff. This is being fed to the farm horses, mixed with equal quantities of wheaten chaff, and is proving a satisfactory feed.

COWRA EXPERIMENT FARM.

M. H. REYNOLDS, Manager.

THE total area of land occupied by wheat and oats for grain and hay (including headlands, roads, and spaces not sown) was approximately 249 acres.

On the experiment area 50 acres of wheat were harvested for grain, the total yield being 448 bushels; average yield 9·76 bushels. For hay, 10 acres of this area yielded 10 tons; average yield, 1 ton.

On other portions of the farm 65½ acres of wheat were harvested for grain, the total yield being 952 bushels; average yield, 14·53 bushels. The area of the same cereal harvested for hay was 59½ acres, and the total yield was 60 tons; average yield, approximately 1 ton.

In all 34 acres of oats were harvested for grain, the total yield was 172 bushels; average yield, 5 bushels. Two acres of oats were harvested for hay, the total yield being 2 tons; average yield, 1 ton.

The low average yield from the Experiment area is due chiefly to the poor showing of Federation, which occupied the greater part of the area in the experiments. The average yield from other areas, averaging approximately 5 bushels per acre more than from the area under experiments, is due to Bomen and Huguenot, which practically failed, being cut for hay. This had also to be done with a portion of the crop of Yandilla King on the flat lands where it had been badly frosted.

The dryness of the season was responsible for an absence of natural grass seed for grain-eating birds, such as sparrows and starlings. As there are few instances where early-maturing wheats are grown to the same extent as on this farm, the birds literally flocked in as the grain was maturing. Damage was done by myriads of starlings, especially to the oat crops, and to the wheat crops by both sparrows and starlings, the latter flattening out the crops wherever they lodged. Together with these pests there were, at harvest time, severe wind and rain storms, which beat down the wheat and oats. As an instance of the extent of the combined damage, it may be stated that the oat crops looked like a yield of 20 bushels to the acre, but the rain storms and birds destroyed and beat them into the soil, only 5 bushels per acre being gained. A neighbouring farmer's oat crops were so damaged that he did not bother to harvest at all. Between 1st April and 31st October, 1914, 868 points rain was registered. The season was extremely dry owing the absence of useful rains during May and June, and from mid-July to mid-November, 1914.

Blight in Maize.

In connection with a recent statement in the public press that "on the Macleay the blight in the maize had already considerably reduced the yield, Mr. E. Mackinnon, Assistant Biologist, furnished a report, in which he remarked that the term "blight" is a very comprehensive one, and may apply to an insect or a fungous or bacterial attack. The diseases of maize, sometimes designated "blight," are the leaf stripe (due to a *Helminthosporium*) and a bacterial disease (due to *Pseudomonas stewarti*). The former chiefly attacks the leaves, giving it sometimes a frost bitten appearance; the latter is not known in Australia, but as the bacteria are carried on the seed, it is quite possible that it may be introduced at any time with parcels of American seed corn. Possibly, also, "ear-rot" or "head smut" is meant.

A report on the subject was forwarded by Mr. G. Marks, Inspector of Agriculture, who stated that the blight referred to was "leaf blight," due to a *Helminthosporium*, which was mentioned in unpublished reports to the Department several months ago. The districts of Macleay, Hastings, and Manning Rivers were most affected, though there have also been evidences of it in the Bellingen, Clarence, Richmond, and Tweed districts.

This blight, the report continued, invariably appears in all the late plantings of maize when the heavy autumn rains set in, and particularly on low-lying situations. This season, however, it appeared very much earlier, owing to the phenomenally wet spring and early summer. Many areas were completely destroyed on account of the leaves being killed off long before the plants were half grown. Where cobbing had been well advanced, the effects were not so serious.

It must be remembered, too, that the total yield on the Macleay is also affected this year by a reduction in the acreage devoted to maize, considerable areas of land having to be left idle because heavy and continuous rains had prevented farmers from getting on to the land, while further areas that had been planted were seriously affected by the saturated condition of the soil.

The treatment of affected areas advocated by the Inspector was, that where the trouble had appeared before cobbing was well advanced, the crop should be fed to the dairy herd, and ploughed out. Since the beginning of the present year, however, hot and dry conditions have prevailed, and much of the trouble has been checked, and several areas of late (January) plantings have been observed that, so far, look perfectly healthy. Had the usual heavy late summer and autumn rains fallen, the losses from blight would certainly have been serious. It appears every wet autumn with many late-sown crops, but as a rule it does not cause very great damage. The Macleay district has had very much more than its average rainfall during the present maize season, and hot steamy conditions have accentuated the attack there, while other districts usually affected have been more fortunate.

The report concludes: "As this disease appears when hot showery conditions prevail over some weeks, it is difficult to recommend anything that is commercially applicable. One trouble is that farmers grow maize continuously on the same land year after year. What is wanted is the spelling of maize-sick lands, rotation of crops, and the more general use of leguminous crops for green manuring. Good results are following wherever this system is being practised."

Rainfall and Production.

Explanatory Notes on Wheat and Sheep Graphs.

L. McCOOK, Commonwealth Meteorological Office.

The accompanying graphs have been compiled from data obtained from "Results of Rain and River Observations," a Commonwealth Weather Bureau publication, and "Knibbs' Statistical Register," and in addition some copies of returns furnished by the Government Statistician for New South Wales.

The *modus operandi* which has been adopted has been to take the number of rain stations in New South Wales from which daily rainfall is obtained within given areas, and to work back to 1873—a period of forty years. The numbers of stations gradually diminish as we go back.

The wheat and sheep are taken for the whole of New South Wales. It may be argued that it would be inaccurate to compare wheat production for the whole State with the rainfall over a given area of the State (the wheat areas), from which the rainfall graph has been compiled. I investigated this point, and found that the so-called wheat areas produce 223/225ths of the total wheat production in the State; and, as I have taken the wheat figures to the nearest quarter of a million, this will have no appreciable effect on the curves.

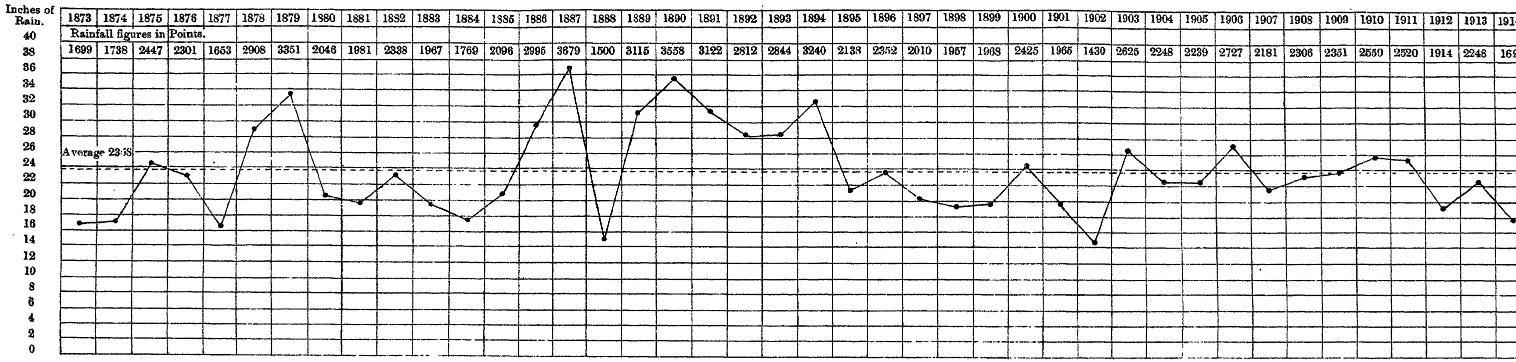
As regards sheep, the figures for the last ten years give an average of three million less for the area west of the 30-inch isohyet than for the whole State. I have been unable to obtain the figures for the various divisions for more than eleven years back (1903-1913), and in any case a uniformity is shown which does not affect the rise and fall to a very noticeable extent.

Graphs A 1 and A 2 show at a glance the years that were above and those that were below the average, and there is a general tendency to approach more closely to the average during the years 1903-1912. The droughts of 1888 and 1902 are well defined, but the latter shows the more disastrous effects upon production, as it follows a period of six years with a rainfall below the average, with one break—1900, a little above—whereas the 1880 drought was preceded and succeeded by very good years.

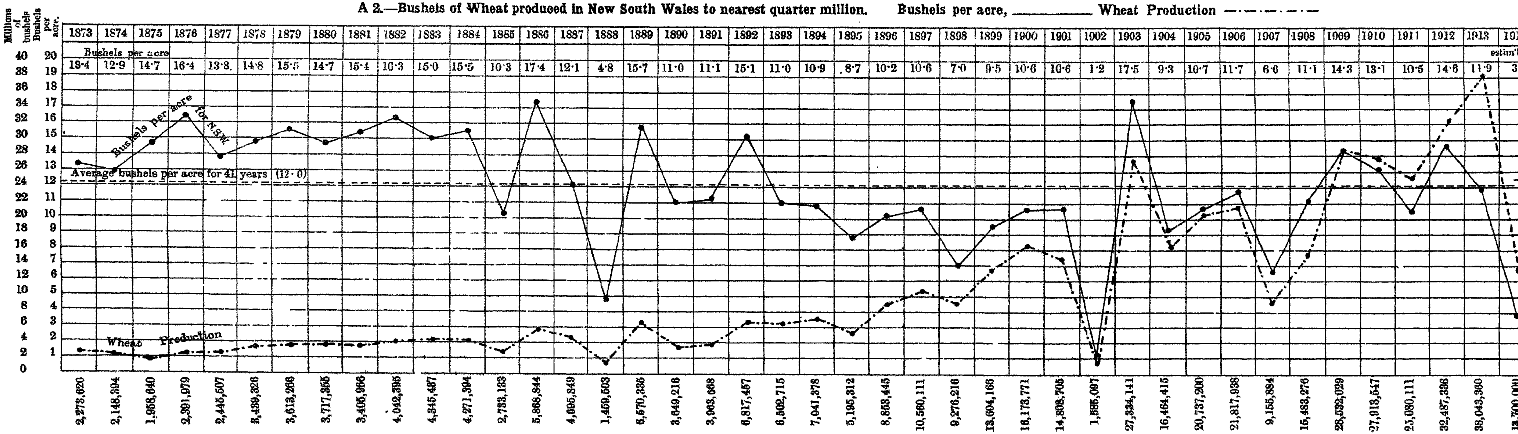
The effects of these droughts upon production are interesting, in so far as the 1888 drought shows very little effect upon the sheep production (Graphs B 1 and B 2), whereas the 1902 drought proved very disastrous. The explanation probably lies in the fact that sheep can be tided over one bad year, but not over a series of bad ones. The wheat curves (Graph A 2) show a quicker response in both drought years and good ones. The curves in this graph representing the bushels per acre show a general tendency to a lowe

A 1.—GRAPHS OF RAINFALL AND WHEAT PRODUCTION IN NEW SOUTH WALES.

Compiled from 42 Years' Records of Stations between the 15 and 30-inch Isohyets.

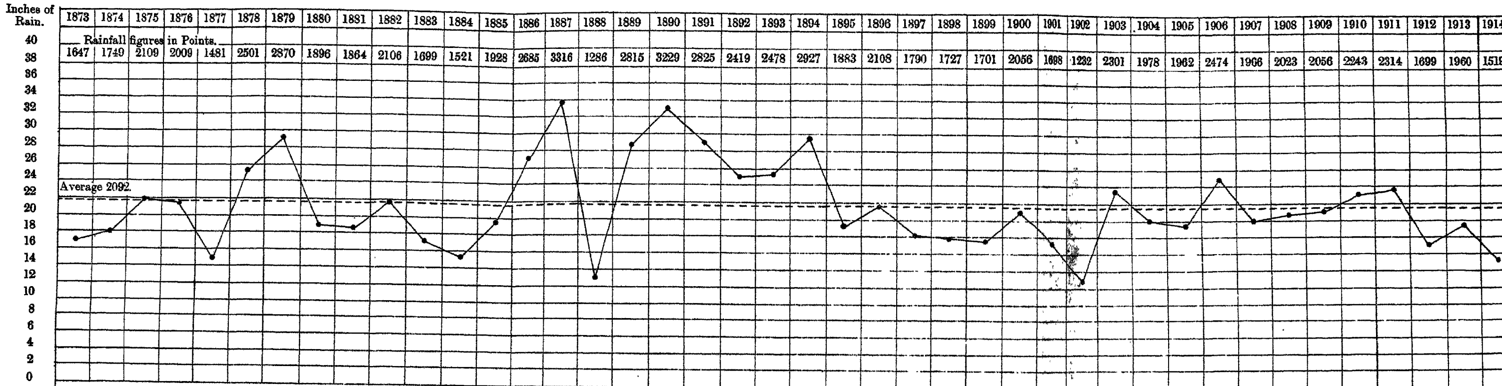


A 2.—Bushels of Wheat produced in New South Wales to nearest quarter million. Bushels per acre, ——— Wheat Production —·—·—·—

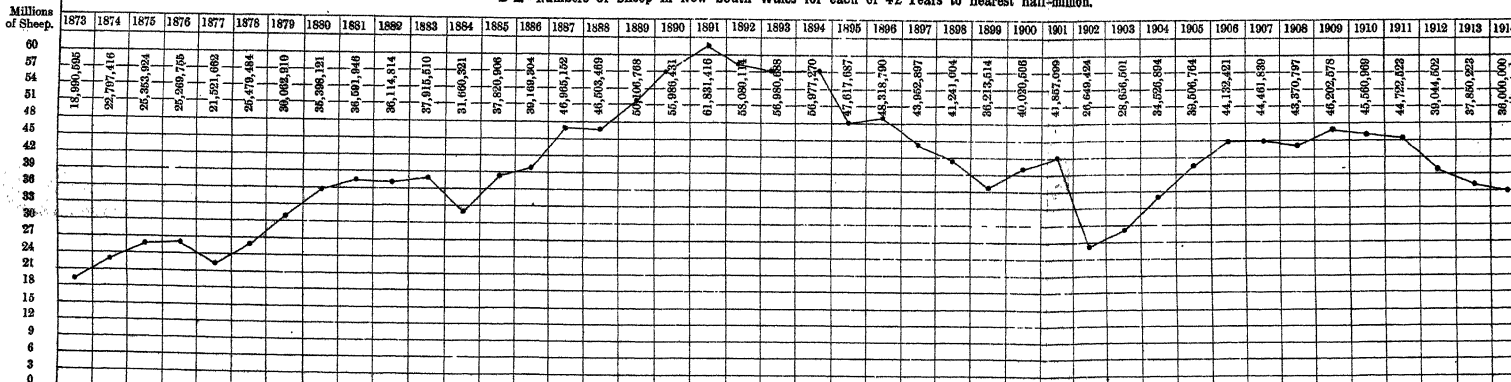


B 1.—GRAPHS OF RAINFALL AND SHEEP PRODUCTION IN NEW SOUTH WALES.

Compiled from 42 Years' Records of Stations West of the 30-inch Isohyet.



B 2.—Numbers of Sheep in New South Wales for each of 42 Years to nearest half-million.



During the past few years, this bean has been cultivated in several private gardens in the neighbourhood of Sydney, and correspondents from other parts of the State have also forwarded seeds to the National Herbarium for determination and report.

It seems to have been grown in northern New South Wales for some considerable time, and seeds were forwarded by a correspondent from Narrabri, through the Chief Inspector of Stock, who says that the seeds from which the plants were grown were originally obtained from the Hunter River District. I have received some again this year from the Manning River.

In looking through the Botanical Gardens Museum collection, I find that there are seeds from plants grown at West Maitland in 1902. These were received through the Department of Agriculture. There are also seeds forwarded by an officer of the Lands Department, from plants grown at Turramurra in June, 1908.

With a view to testing the plant as a forage or vegetable crop, I obtained a few seeds from a plant grown at Mosman by Mr. A. N. Allen. Four seeds were sown in my garden at Penshurst on the 29th November, 1911.

These all germinated, and although the following months of December and January were exceptionally hot and dry, the plants continued to make a very fair growth, and resisted the drought conditions. A number of other leguminous plants were grown alongside, including French beans, Limas, scarlet runners, cow-peas, and mung beans, all of which had to be constantly watered to keep them alive, whilst the "Jack Bean" was planted on the upper part of the patch of soil, and was not watered, nor could any soakage reach the plants from the others.

Value as a Forage Crop.

As the plants with me have proved to be hardy, and are able to stand dry conditions better than most other leguminous crops, and so far as my experience goes appear to be free from the attack of fungus disease, they appear to be worthy of further experiments on a more extensive scale. The plant has already been cultivated with satisfactory results in Japan, and is described and figured as one of the economic plants of that country by Professor Georgeson.

An account of it is also published by Professor L. H. Bailey, who gives the following particulars concerning it. Quoting Professor S. M. Tracy, of the Agricultural College of Mississippi, in August, 1895, he says: —

"I know very little about 'Jack Beans.' I suppose them to be *Canavalia ensiformis*. A few Mexicans who have seen them say that they are common in that country, where they are used as food.

"One of my assistants saw them at a country fair in the southern part of this State five years ago, and brought a couple of pods home with him. I grew them on small plots three years, and last year had about half an acre, which yielded at the rate of 23 bushels per acre. A neighbour claims to have had 30 bushels, which, I think, is reasonable, as my crop this year appears as though it would be even heavier. I have eaten the beans, and find them quite edible, though rather coarse. I have not fed them to cows, but chemical analysis show them to be fully equal to other beans.

"We have 10 acres this year, and propose to give them a thorough test in feeding next winter. I do not know anyone who has used them, or who has grown them in any way."

The "Jack Bean" or "Sword Bean."

(*Canavalia ensiformis*, DC.)

Professor Bailey further states :—

The result of this last crop was reported on by Professor Tracey, as follows :—"The 'Jack Beans' yielded 30 to 40 bushels per acre. We have used the beans this winter in feeding steers, cows, and hogs, and I am greatly surprised to find them of almost no value. Cattle soon learn to eat the meal made from the beans, but it appears to be very difficult of digestion. We have used it constantly for ten weeks until yesterday, when I decided that there was no occasion for any further work. Next week I shall commence feeding the cooked meal, and if I get satisfactory results from that, shall try cooking some of the beans also."

It will be seen from the above that as a cropper it has given fairly satisfactory results, but its feeding value is somewhat doubtful at present. In a paper published by F. G. Krauss, the Agronomist at Hawaii Agricultural Experiment Station, a more favourable account is given, as will be seen from the following abstract from his paper :—

While grown to some extent in the Southern States, the plant does not appear to thrive as well there as here, and no extensive feeding experiments are reported.

The bean-meal is said not to be very palatable or digestible for cattle, but this may be due to a too limited experience in its use.

The early feeding experiments with the green fodder in Hawaii gave similar results to those reported above, but as feeders gained in experience the fodder was found to be both palatable and nutritious for dairy cows as well as swine.

As with most new feeds it is important to use in the beginning only a small proportion of the new feed in the accustomed ration, and then increase the proportion gradually. The Dowsett and Pond dairies have fed green "Jack Beans" and sorghum in equal proportion to dairy cows with excellent results.

The crop requires about a month longer to mature than do cowpeas, but the yield is proportionally greater. Yields of 16 to over 20 tons of green fodder per acre have been reported from various sources.

The best yield of seed reported is 1,200 lb. per acre.

While a single crop is usually grown from each sowing, the station has occasionally grown a good ratoon crop. Such crops, however, are, subject to a leaf-blight common to the bean family.

Otherwise the crop is exceptionally free from disease and insect pests, a point greatly in favour over the cowpea. Another possible advantage possessed by the "Jack Bean" over the rambling legumes is the absence of trailing stems which might interfere in some forms of inter-cropping. It is further stated to be well adapted for inter-culture between coffee, rubber, sisal, and other perennial crops, and also as a cover crop to keep down weeds, and prevent wash, and would doubtlessly prove valuable as a green manuring crop.

In addition to the above, it is also recorded as an economic plant, by H. F. Macmillan,* who says that "the young pods are sliced and boiled as a vegetable, and also used in pickles."

In a paper on the Vegetation of Malaysia, by the Rev. J. E. Tenison-Woods, it is stated that "*C. ensiformis* can certainly be used as an esculent as the leaves, pods, and unripe fruits are cooked by the Malays with rice and eaten."

Edible Qualities.

To test the edible qualities of the bean, I gathered five pods which were nearly full grown, on the 19th April, 1912, varying in length from 4 to 9 inches. These were cut up in slices, and cooked in the same way as French beans.

* The name *Canavalia gladiata*, DC., cited by Macmillan, is, according to Index Kewensis, a synonym of *C. ensiformis*, DC., but according to G. Dan, Duthie, and other writers there is a "Sword Bean," which has a climbing habit, and produces brownish or reddish seeds. It seems to me that *C. gladiata* is specifically distinct. *C. obtusifolia* which is quite common in this State is also closely allied but distinct.

The smallest pods were very tender and palatable, but the inner lining of the larger pods proved to be very tough and horny, and unsuitable for use, I think, as a green vegetable, it would be rather wasteful to pull the young pods, say, when they are about 4 inches long. The seeds of the larger pods, however, when fully developed, can be used in the same way as Lima beans or broad beans, and the flavour is much superior to that of the latter.

Methods of Culture.

As the seeds are fairly large, there is very little difficulty in planting them. If the plant is required for green fodder the seed should be planted in rows from 2 feet 6 inches to 3 feet apart, and each seed being about 6 to 9 inches in the rows. If the crop is required for seed the rows should be 4 feet apart, and the seeds 12 inches in the row. For ploughing in as a green manure, or using to check or suppress weeds in orchards, &c., they may be planted much closer than above. The methods of culture may be conducted as for ordinary field beans or pea culture.

They should be sown as soon as all frosts are over, about October.

The following composition of "Sword Bean" is given by A. H. Church:

	In 100 parts.	In 1 lb.
Water ...	12·5 ...	2 oz. 0 gr.
Albuminoids	25·0 ..	4 ,, 0 ,,
Starch ...	48·6 ...	7 ,, 339 ,,
Oil ...	2·8 ...	0 ,, 196 ,,
Fibre ...	7·7 ...	1 ,, 102 ,,
Ash ...	3·4 ...	0 ,, 238 ,,

The nutrient ratio is here 1-2·2, and the nutrient value 80.

Other Experience.

Since the above was written, I have received some seeds together with the following particulars from Mr. B. Harrison, of Burringbar, Tweed River :—

"The 'Jack Bean' succeeded well with me. It is a trailing variety, attaining the length of 2 or 3 feet, and producing pods about 1 foot long, which contain from 8 to 12 beans.

"One great advantage it possesses is that the native insect pests, &c., do not molest it or eat the foliage, and it should prove useful in warm districts as a substitute for 'broad beans.'"

Mr. W. Hardie, Superintendent, Campbelltown State Nursery, New South Wales, has also forwarded me pods, which were obtained from two seeds sown on 13th November, 1913. Mr. Hardie states that "this appears to be a splendid bean. A first-class cropper, a grand grower, and very large pods."

Sudan Grass and its advantages over Johnson Grass.

E. BREAKWELL, B.A., B.Sc., Agrostologist.

A GREAT deal of interest has lately been exhibited in Sudan grass, owing to the glowing reports received from America concerning its success there, and a brief account of the Department's experience with it in different parts of New South Wales should be instructive.

Sudan grass has been cultivated for some considerable time in Northern Africa, whence it was introduced into the United States. Its exact origin has not yet been fixed, but it is believed that it is a form of some African native sorghum, of which there are many. Owing to the absence of the rootstock, it certainly appears to be more closely related to the sorghum family than is Johnson grass; and this view is strengthened by its behaviour at Grafton, where it was observed to be susceptible to rust—a disease that does not attack Johnson grass. It is extremely difficult to distinguish them in the field, and Figs. 3 and 4 show the close resemblance of the inflorescence. The seed of Johnson grass, however, can be distinguished from that of Sudan grass by the different manner in which they break off the inflorescence—the latter generally carrying away with it a small portion of the rachis, whereas the former breaks clean.

Introduction into New South Wales.

Sudan grass was first grown in New South Wales by the Department of Agriculture in the summer of 1913-14, a few rows being planted at Yanco and Grafton from a small quantity of seed brought by Mr. W. M. Carne from America. The results of the small trials were so promising that all the seed was harvested, and during last season a quarter of an acre was planted at Yanco Experiment Farm, the same area on irrigation land at Hay, and some other seed of an improved strain at Grafton. A small sowing was also made at Cowra.

Results of Trials of Sudan Grass.

It was observed that the seed germinates very readily, and growth is very rapid. Under warm and fairly moist conditions, the life of the grass between seeding and heading is about three months. At Yanco it is an annual, being cut down by the frosts. At Grafton Experiment Farm and at the Botanic Gardens, Sydney, however, it is perennial in habit, due, probably, to the mild winter.

The report from Yanco for the first season is as follows:—Seed sown, 26th November, 1913; grass cut, 24th February, 1914; green fodder, about 4 tons to the acre; on 24th March, 1914, new growth about 4 feet high, yielding, perhaps, 3 tons to the acre. (Fig. 1.)

The report from Grafton for the season 1913–14 is as follows:—Sown, 16th February, 1914; germinated well; stooled splendidly; 2 feet 6 inches high on 4th April, and coming into head when eaten down; at the beginning of June was again in flower; appears to be a splendid annual summer grass with a good rooting system, succulent, soft and abundant foliage, a good stooler, and eminently suited for hay purposes.

The large plot at Yanco Experiment Farm was sown, last October, in drills about 2 feet 6 inches apart, the rate of seeding being 12 lb. to the acre. The resultant growth shows, however, that half the amount of seed would have been sufficient, as some isolated plants stooled much more freely than those crowded in the rows. The report from Yanco, as the result of this larger trial, is as follows:—The seed of this grass germinated very well, giving a good stand. The grass grew very quickly, attaining a height of 3 feet 6 inches to 4 feet. The whole of the plot was saved for seed purposes. After cutting, the grass made very rapid growth. It is an annual, which is rather a disadvantage, as far as permanent pasturage is concerned. At the same time, it gives promise of being one of the best so far tried on the farm.

Mr. McDiarmid, Assistant Inspector, Irrigation Area, reports:—Sufficient seed of this grass for one-quarter of an acre was all that was obtainable, and this was sown at Hay. The germination has been very good, and the growth very prolific. Sown during the last week of August, and with three waterings at four to six weeks' intervals, the plants were 3 to 3½ feet high by the end of November. It resembles Johnson grass in appearance, but not in habit of growth. It is an annual, and requires reseeding each year, in which respect it differs from Johnson grass, which retains its vitality from year to year and spreads underground. Sudan grass is hardy, and withstands the interval between the waterings very well.

The Manager of Grafton Experiment Farm reports on the second year's growth of this grass:—This year's growth is not as good as last. There is no doubt about its palatability, as cows broke in one night and ate it down. It has been attacked this year by rust.

At Cowra, probably owing to an extremely dry spring, followed by hot winds in summer, the growth was unsatisfactory.

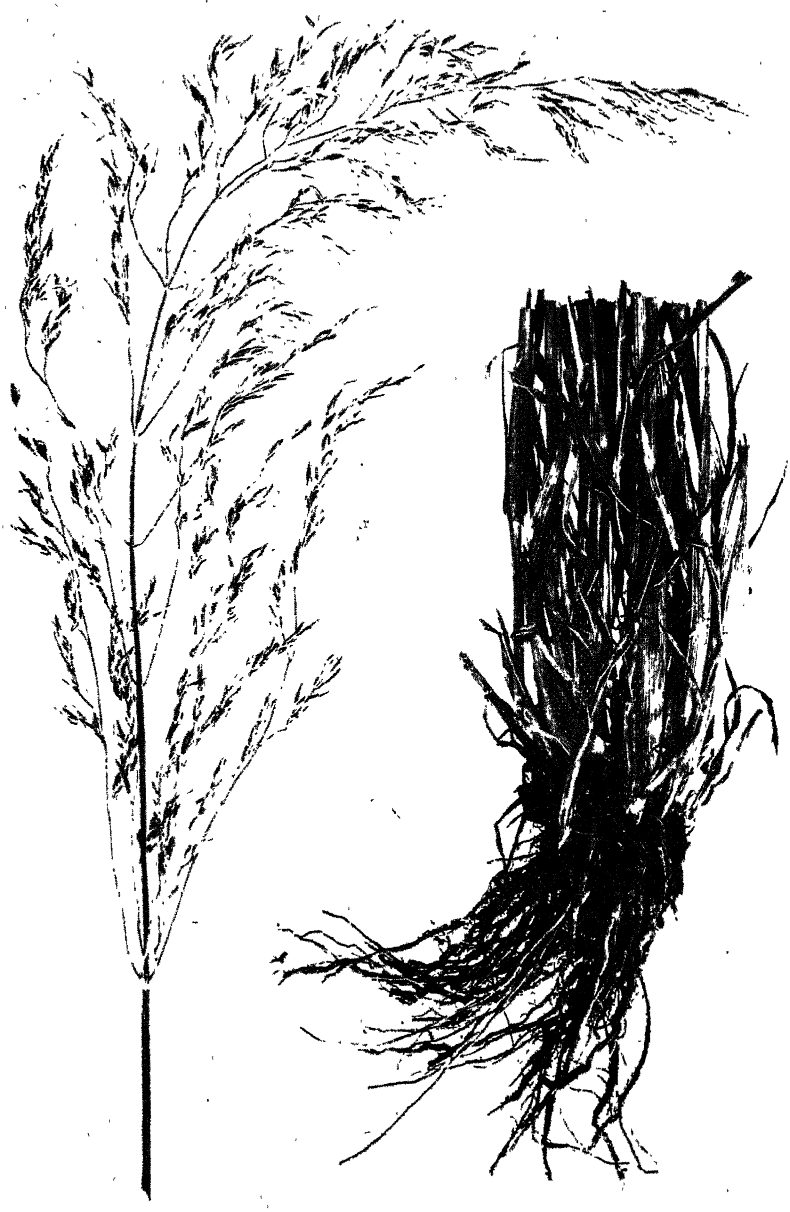
Prospects of Sudan Grass in New South Wales.

In this State, Sudan grass is yet in its experimental stages, but it has already displayed certain striking advantages. The seed germinates very readily, the growth is rapid, the flag succulent and palatable, and at least two cuttings can be obtained during the season. Its annual character renders it unsuitable as a pasture grass, the permanence of the plant being no greater than sorghum, maize, or other summer crops. Fig. 2 shows a promising perennial grass at Yanco (*Setaria nigrirostis*); although it does not grow as high as Sudan grass, its perennial habit renders it superior as a pasture grass. The same remark applies to Rhodes grass, *Phalaris bulbosa*, and other well-known pasture grasses on the area. The chief uses of Sudan grass are

Fig. 1.—Sudan Grass at Yanco.

Fig. 2.—A promising perennial grass at Yanco. (*Setaria nigrirostis.*)
Compare height with that of Sudan Grass.

SUDAN GRASS AND ITS ADVANTAGES OVER JOHNSON GRASS.



SUDAN GRASS

Fig. 3.—Inflorescence and root system of Sudan Grass.

SUDAN GRASS AND ITS ADVANTAGES OVER JOHNSON GRASS.

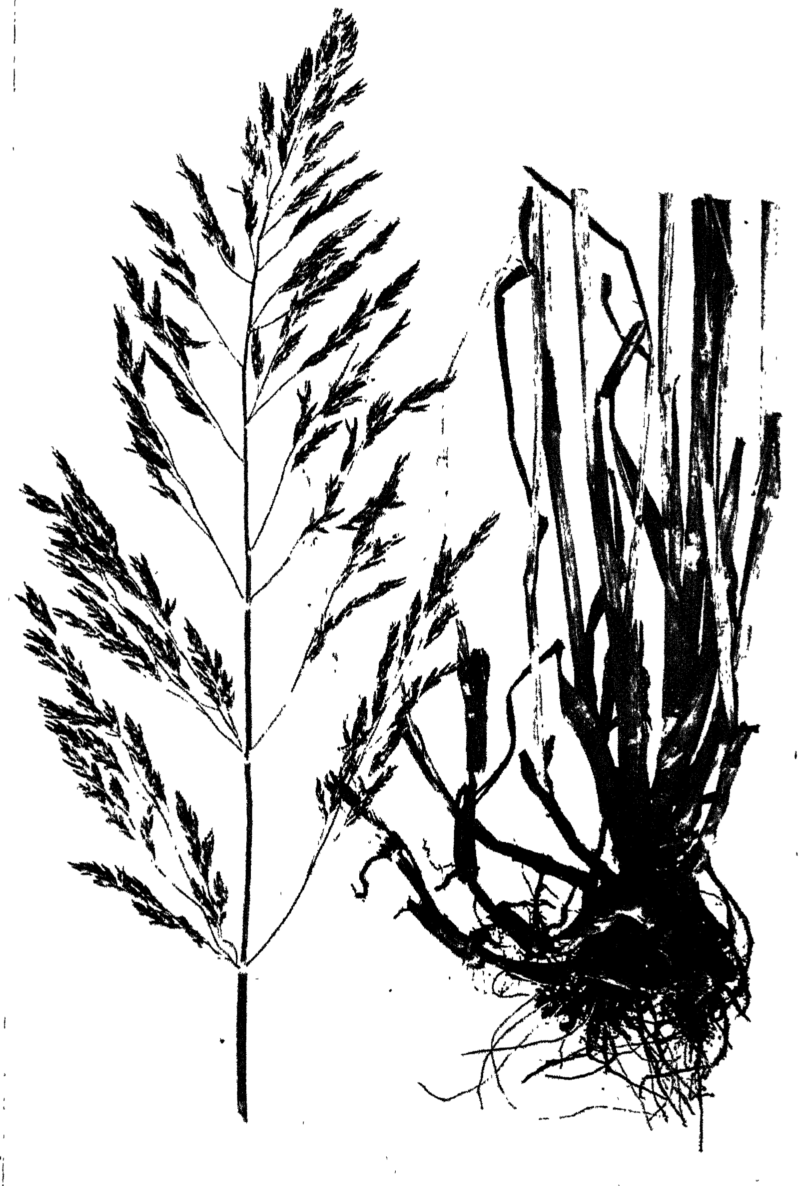


Fig. 4.—Inflorescence and root system of Johnson Grass.
Note the underground root-stocks.

SUDAN GRASS AND ITS ADVANTAGES OVER JOHNSON GRASS.

evidently as a soiling or hay crop. On the Irrigation Area it can hardly be expected to compete with sorghum or maize as a soiling crop, and the same remark might apply to coastal districts with a good summer rainfall; but in districts with an uncertain summer rainfall, it is quite possible that it will prove superior to sorghum or maize, and particularly millet, as a soiling crop, owing to the quickness of its growth and its reputed hardiness under dry weather conditions.

As a hay crop it should be superior to millet hay. Unfortunately, however, the demand in New South Wales for millet hay, or a grass hay of any description, is extremely limited at present. In America, the hay of certain grasses commands a higher price and has a larger sale than the cereal hays, and probably the reputation of Sudan grass in the States is partly due to this fact. The popularity of Sudan grass in New South Wales will be restricted until the demand for grass hays of the better quality improves.

The market price of the seed in America is very high; it is quoted in some cases at 4s. per lb., which is due, of course, to the limited supply available. Owing, however, to the fact that the grass yields seed very heavily (at least 300 to 400 lb. per acre), there is no reason why it should not eventually be sold almost as cheaply as sorghum seed.

The American authorities point out the extreme care necessary to buy seed unadulterated with the seed of Johnson grass, which it closely resembles. The danger is a real one in this State also, as far as the coast is concerned. The experience of many dairy farmers with Johnson grass has already been too bitter and costly to take any risks in this direction.

References in American Literature.

References to this grass are numerous in the American bulletins and newspapers. The results may be summarised as follows:—The grass does particularly well in the southern States—that is, districts possessing a good summer rainfall. Similar climatic districts in this State are found in our north and north-west. Two cuttings are generally obtained, and the average yield appears to be about 3 tons of hay to the acre. Its palatability is already proved. It is generally considered preferable to millet as a catch crop. Texas reports that it stood the dry weather better than maize, sorghum, or milo. Reports from Tennessee, however, indicate that it stood the dry weather only fairly well, and that the Rhodes grass out-yielded the Sudan grass. The hay is everywhere highly spoken of.

A Comparison with Johnson Grass.

Sudan grass is distinguished from Johnson grass by the presence in the latter of underground rootstocks. Johnson grass is rarely found outside cultivated areas, where its rapid creeping habit renders it, when once established, a weed of the worst description. Its use as a fodder, and its disadvantages as a weed, have already been described in recent issues of the *Agricultural Gazette*, and do not require repetition.

Official Milk and Butter Records.

M. A. O'CALLAGHAN

ANOTHER batch of milk and butter records is published hereunder. There are some very excellent records, especially the milk returns shown by Lily III and Camelia II, which are well known prize winning Shorthorns in the Darbarlara Stud, the cow Camelia II having won first and champion at this year's Sydney Show. Some of the milk and butter records of Mr. Lamond's Holsteins should be of educational value to many of our farmers, especially those on low, rich river flats, that are capable of carrying animals of this breed.

Mr. A. L. Manning's Jersey Herd.

Period of Test.	Name of Cow and Herd Book No.	Age at beginning of Test.	Date of last Calving	Total. Milk.	Total. Butter.	Average of Butter Fat Test.	Yield on last day of Test. Milk.	Yield on last day of Test. Butter.
days		y. m.		lb.	lb.		lb.	lb.
273	Queen of the Isles, 1337	6 3	22 Feb., 1914..	6,196	323	4·6	24·50	1·22
273	Milkmaid 37th, 1222 ...	6 2	1 March, 1914...	6,453	336	5·0	24·00	1·43
273	Rambler, 1343	6 3	1 March, 1914 ..	5,491	332	5·3	21·00	1·32
273	Vanquish, 1442	4 0	8 March, 1914...	4,738	293	5·4	17·50	1·21
273	Noble Jessie	2 6	3 March, 1914...	4,864	298	5·4	18·00	1·31
273	Lady Nell...	2 7	14 March, 1914 ..	5,301	331	5·4	21·50	1·46
273	Zoe V of Warragaburra, 1497	4 6	5 April, 1914 ..	5,302	318	5·3	18·00	1·22
273	Prelude, 1293	4 0	1 April, 1914 ..	5,590	298	4·7	20 00	1·14
273	Melodious, 2336	3 6	13 April, 1914..	6,580	375	5·0	18·00	1·09
273	Colleen Bawn	2 3	7 April, 1814...	4,405	285	5·8	13·00	0·94
273	Clarionette, 1709 ..	3 4	23 April, 1914...	5,562	339	5·4	18·00	1·19
273	Majesty's Starbright, 1185.	3 6	19 April, 1914 .	5,547	327	5·2	15·50	0·83

Scottish Australian Investment Co.'s Shorthorn Herd.

Period of Test.	Name of Cow and Herd Book No.	Age at beginning of Test.	Date of last Calving.	Total. Milk.	Total. Butter.	Average of Butter Fat Test.	Yield on last day of Test. Milk.	Yield on last day of Test. Butter.
days		y. m.		lb.	lb.		lb.	lb.
273	Camellia II, 85	11 0	26 Jan., 1914...	10,896	463	3.6	29·50	1.23
273	Virginia III	2 0	9 March, 1914...	6,987	365	4·5	20·50	1·13
273	Champion VIII	2 0	23 March, 1914...	6,950	297	3·8	9·00	0·46
273	Nina IV	3 0	21 March, 1914...	5,562	224	3·6	9·00	0·42
273	Camellia VIII	2 0	6 March, 1914...	7,391	286	3·4	17·50	0·71
273	Vislo V, 1786	6 0	11 April, 1914...	5,727	254	4·0	5·50	0·34
273	Shamrock XIV	3 0	15 April, 1914...	6,084	283	4·1	7·00	0·34
273	Camellia IV, 837 ..	8 0	28 April, 1914...	7,815	310	3·4	15·00	0·58
273	Lily III, 1020	8 0	26 April, 1914...	12,897	507	3·5	26·00	0·91

Mr. O. H. Gollan's Jersey Herd.

Period of Test.	Name of Cow and Herd Book No.	Age at beginning of Test.	Date of last Calving.	Total. Milk.	Total. Butter.	Average of Butter Fat Test.	Yield on last day of Test. Milk.	Yield on last day of Test. Butter.
days		y. m.		lb.	lb.		lb.	lb.
273	Annie Laurie, 1528 ..	8 0	12 Dec., 1913...	3,489	205	5·1	9 50	0 59
273	Highfield Queen, 2081 ..	7 0	5 May, 1914..	3,846	231	5 2	12 50	0 74
273	Queen III...	3 0	25 March, 1914 ..	3,994	216	4·6	13·75	0·76
273	Ruth of Woodburn, 2597	8 0	20 May, 1914...	4,240	272	5·5	12·50	0 84
273	Belladonna	2 0	18 June, 1914...	3,564	215	5·1	9·50	0 57
273	Maitland's Silver Stream	3 0	8 July, 1914...	4,035	240	5 4	11·25	0 75
273	Queen Anne of Woodburn.	7 0	12 June, 1914 .	4,566	272	5 2	4·25	0·30

Mr. Samuel Hordern's Jersey Herd.

Period of Test.	Name of Cow and Herd Book No.	Age at beginning of Test.	Date of last Calving.	Total. Milk.	Total. Butter.	Average of Butter Fat Tests.	Yield on last day of Test. Milk.	Yield on last day of Test. Butter.
days		y. m.		lb.	lb.		lb.	lb.
273	Beauty of Retford ..	3 9	6 Dec., 1913...	4,102	263	5 8	13 50	·90

Mr. A. C. Lamond's Holstein Herd.

Period of Test.	Name of Cow and Herd Book No.	Age at beginning of Test.	Date of last Calving.	Total. Milk.	Total. Butter.	Average of Butter Fat Tests.	Yield on last day of Test. Milk.	Yield on last day of Test. Butter.
days		y. m.		lb.	lb.		lb.	lb.
273	Minnie II of Numba ...	10 0	14 March, 1914...	13,707	498	3·2	40·50	1·68
273	Sunbeam	......	1 May, 1914...	10,506	414	3·5	6·50	·30
273	Pride	......	26 April, 1914...	12,477	439	3·1	35·00	1·26
273	Bosker	..... .	28 April, 1914...	10,181	329	2 9	8·50	·37
273	Know Not	10 0	23 May, 1914...	12,562	511	3·5	37·50	1·59
273	Joan	4 3	8 August, 1914..	11,391	398	3·1	27·50	1·00

Messrs. Kinross Bros.' Guernsey Herd.

Period of Test.	Name of Cow and Herd Book No.	Age at beginning of Test.	Date of last Calving.	Total. Milk.	Total. Butter.	Average of Butter Fat Tests.	Yield on last day of Test. Milk.	Yield on last day of Test. Butter.
days		y. m.		lb.	lb.		lb.	lb.
273	Rose Pearl	3 9	19 April, 1914...	5,574	274	4·3	9·00	·48
273	Butterfly	3 3	17 May, 1914...	5,038	269	4·6	14·00	·73
273	Dunalpine Empress ...	2 6	2 June, 1914...	5,922	275	4·0	13·00	·61

Miss E. C. Walker's Jersey Herd.

Period of Test.	Name of Cow and Herd Book No.	Age at beginning of Test	Date of last Calving.	Total. Milk.	Total. Butter	Average of Butter Fat Tests.	Yield on last day of Test. Milk.	Yield on last day of Test. Butter.
days		y. m.		lb.	lb.		lb.	lb.
273	Lydia	......	5 October, 1913 ..	6,776	351	4·6	10·25	·70
243	Fleur de Bois	......	20 January, 1914..	4,593	219	4·2	16·00	·91
273	Leda's Snowdrop IV ...	2 0	7 May, 1914 .	7,167	386	4 6	21·00	1·27
273	Olive, 1269	5 10	28 June, 1914..	7,864	400	5·1	12 75	·82

Mr. E. P. Perry's Guernsey Herd, at Parkville.

Period of Test.	Name of Cow and Herd Book No.	Age at beginning of Test.	Date of last Calving.	Total. Milk.	Total. Butter	Average of Butter Fat Tests.	Yield on last day of Test. Milk.	Yield on last day of Test. Butter.
days	Amended Test—	y. m.		lb.	lb.		lb.	lb.
273	Betsy III of the Vaquiedor (imp.). (See March, 1915, issue).	2 10	26 Feb., 1914...	5,514	288	4 6	17·50	·91

Mistletoes as Fodder Plants.

This subject has again been brought under notice by Mr. Walter Thompson, of Shuttleton, in the Cobar District, and in drawing attention to the prevalence of one of them (*Viscum articulatum*) on the Wilga (*Geijera parviflora*) has suggested that its growth should be encouraged with a view to destroying useless scrub, and at the same time furnishing food for sheep and cattle.

Now Mistletoes are propagated through the action of a little bird which eats the fruits and drops the seeds on branches of trees and shrubs. These branches should be smooth, because the young parasite cannot penetrate a great thickness of stringy or hard bark.

The matter of artificially spreading the Mistletoe is one which, although it has often been talked about, has not, in my knowledge, been carried out on a large scale, and if the readers of the *Gazette* know of any such experiments I should be glad to hear of them.

I have in my mind's eye scrub that we deem to be useless, and which grows on land which, as far as we can see, does not support edible plants of any kind. Of course there is the element of risk that the Mistletoe might get ahead of us and destroy plants that should be preserved; but the possibility of getting some feed for flocks and herds out of land which, at the present time, produces none or very little, seems worth keeping in mind.
—J. H. Maiden.

Exports and Cold Storage.

W. H. P. CHERRY, Acting Officer-in-Charge, Exports and Imports Branch.

Rabbits and Hares.

The quantities of rabbits packed at the respective country and city freezing works during the year ended 31st December, 1914, totalled 610,581 cases, an increase of 45,741 cases compared with the preceding year.

The above cases represented 14,653,944 single rabbits, and, with an estimated additional 10 per cent. for rejected and condemned carcases, were responsible for a reduction of the pest by over 16,000,000 animals in the year.

The quantity of hares exported is diminishing. For the past year they totalled about 6,000 carcases.

The following are the quantities and values of rabbits and hares exported during the past three years:—

	Quantities.	Value.
1912	5,110,161 pairs	£252,073
1913	6,940,965 „	373,633
1914	7,205,944 „	367,277

Apart from the above, there were exported rabbit skins as follow:—

	Quantities.	Value.
1912	5,224,410 lb.	£318,934
1913	4,872,907 „	310,964
1914	5,062,330 „	201,501

It will be seen that, while the quantity of skins exported in 1914 exceeded that of the previous year, the values declined by £109,463.

The following works were in operation packing and freezing rabbits during the year:—

Fresh Food and Ice Co., Limited, Sydney.
Metropolitan Ice Co., Limited, Sydney.
Sydney Ice Skating Rink and Cold Storage Co., Limited, Sydney.
Country Freezing Co., Limited, Harden, Dubbo, Warrigal, Blayney, Young, Gunnedah, Orange.
Bungendore Freezing Co., Limited, Bungendore.
Braidwood Freezing Co., Limited, Braidwood.
Crookwell Freezing Co., Limited, Crookwell.
Dunedoo Refrigerating Co., Limited, Dunedoo.
Lachlan Freezing Co., Limited, Cowra.
J. Moore, Camden.
Mudgee Freezing Works (O'Brien Bros.), Mudgee.
G. J. Rohr, Wagga.
Rylstone Freezing Works, Rylstone.
W. White, Limited, Tumut, Germanton, Cootamundra.
Wilson & Flood, Bathurst.

In addition to the above, the following new works are in operation the present year :—

Municipal Cold Stores, Sydney.
Wilson & Flood, Galong.
Nimitybelle Refrigerating Co.

Eggs.

The four city firms which catered for the cold storage of eggs during the 1914–15 season held 507,672 dozens in shell and 363,240 dozen in pulp, a total of over 10,000,000 eggs.

The appended figures show the annual increase of this business from its inception seventeen years ago :—

Eggs held in cold store—

1898 ...	11,000 dozen.	1907–8 ...	250,000 dozen.
1899 ...	93,000 „	1908–9 ...	305,044 „
1900 ...	96,000 „	1909–10 ...	329,976 „
1901 ...	140,272 „	1910–11 ...	420,372 „
1902–3 ...	130,524 „	1911–12 ...	564,372 „
1903–4 ...	151,128 „	1912–13 ...	444,996 „
1904–5 ...	253,908 „	1913–14 ...	476,312 „
1905–6 ...	288,648 „	1914–15 ...	507,672 „
1906–7 ...	150,322 „		

Eggs held in pulp—

1913–14	392,080 dozen.
1914–15	363,240 „

Poultry.

Estimated Live Poultry on Farms and Holdings of 1 acre and upwards.

At end of Year.	Fowls.	Ducks.	Geese.	Turkeys.	Other.	Estimated Number of Eggs obtained during Year.
	No.	No.	No.	No.	No.	doz.
1909	2,672,385	257,741	25,878	224,187	36,000	12,096,859
1910	3,072,375	315,550	28,980	244,456	35,015	13,204,906
1911	3,213,200	321,400	26,200	232,500	4,600	13,637,000
1912	3,351,600	261,100	23,900	216,300	6,000	13,769,000
1913	3,878,234	273,919	24,545	248,693	5,464	15,136,933

It will be seen that during the four years 1909 to 1913, the number of fowls increased by 1,205,849 head, and eggs by 3,040,074 dozen. The figures for 1914 are not yet available.

Export Poultry.

The prices for good table fowls and ducks throughout the year were considerably above London parity; hence there were no exports to England. Turkeys, however, were cheaper than for a number of years, and over 5,000 were shipped to reach London before Christmas.

The export of frozen poultry to Eastern ports is increasing. There were shipped during the year 14,940 fowls and ducks, and 5,800 turkeys. Manila and Singapore were the principal ports of destination.

Exports.

QUANTITY OF PRODUCE inspected under the Commerce Act during 1913 and 1914.

Description.	Total.	
	Year 1913.	Year 1914.
	packages.	packages.
Canned Fruit	4,618	1,561
Fruit	101,932	58,517
Honey	166	133
Jam	4,575	8,632
Leather	13,873	13,410
Maize	1,538	497
Millet	57	Nil.
Plants	615	547
Potatoes	22,791	26,664
Seeds	6,895	6,683
Hares	518	510
Rabbits	589,308	590,929
	746,916	708,086

QUANTITIES OF FRUITS, VEGETABLES, and PLANTS inspected under the Quarantine Act (Plants), during 1913 and 1914.

Description.	Total.	
	Year 1913.	Year 1914.
Bananas (bunches)	573,547	546,720
Bananas and Pines (cases) ...	21,651	31,977
Fruit (centals)	127,407	111,458
Cereals, Pulse, and Seeds (centals)	580,303	509,949
Vegetables, Corms, Bulbs (centals)	41,024	118,790
Nuts and Nutmegs (centals) ...	22,624	24,722
Plants (number)	129,277	219,048

VALUE OF PRINCIPAL ARTICLES Exported Oversea.
Years 1913 and 1914.

	1913.	1914.
	£	£
Animals	54,098	98,861
Butter...	988,143	917,543
Coal	1,120,167	1,059,323
Copper, ingots	1,977,344	1,448,790
Fruits—Fresh	36,206	22,514
Gold	1,335,763	1,324,633
Grain—Wheat	2,723,209	3,383,008
Flour...	509,961	469,363
Lead	1,639,652	1,551,558
Leather	369,210	423,581
Meats—Beef	247,234	408,700
Mutton and Lamb	1,215,878	1,373,946
Rabbits and Hares	373,633	367,277
Preserved	575,855	747,131
Oil—Coconut	85,547	118,486
Ores—Spelter, &c.	1,211,289	785,654
Silver—Bullion	310,033	328,857
Skins—Hides...	910,609	1,008,477
Sheep...	439,525	495,430
Rabbit and Hare	310,694	201,501
Other	612,812	184,251
Tallow	1,002,076	882,627
Timber	277,223	265,493
Tin, ingots	407,381	132,439
Wine	18,718	24,514
Wool	11,699,858	8,328,206
Other articles	2,389,971	3,587,139
Total	£32,842,789	£29,939,312

GRAFTED VINES FOR 1916 PLANTING.

IT is requested that vignerons who intend to place orders for vines grafted on phylloxera resistant stocks to be planted in 1916 should advise the Department as early as possible what their requirements will be. It will be necessary to make arrangements in the nursery during the coming winter and spring for the vines that are to be distributed for planting in the following year, and it will be an obvious advantage for the Department to have some indication of the number that will be needed and the varieties of stocks and scions. Vignerons are, therefore, invited to indicate their requirements at their earliest convenience.

Gummosis, or the Gumming of Fruit Trees.

G. P. DARNELL-SMITH, B.Sc., F.I.C., F.C.S., Biologist; and E. MACKINNON, B.Sc., Assistant Biologist.

PROBABLY no sight is more familiar to the grower of peach, apricot, cherry, or plum trees than the exudation of gum from the wood. Sometimes large masses of it are exuded, sometimes it occurs only in minute pearly drops. It may be found on the youngest twigs or on the main trunk. On certain occasions it does not even make its appearance on the exterior, but collects in the interior of the cells or in cavities known as "gum pockets." A tree exhibiting any of these conditions is said to be suffering from *gummosis*, and while the causes are very varied, the abnormality is a fairly certain indication that "something is wrong" with the tree.

The phenomenon of gummosis has, perhaps, excited more investigation than any other problem in plant pathology. In 1910, O. Butler* made a somewhat exhaustive study of gummosis, and the following notes and historical survey are gathered largely from his paper. As gummosis of *Prunus* (peach, apricot, cherry, plum, almond) and *Citrus* (orange, lemon, mandarin, citron) are indistinguishable maladies, they will here be treated of together. According to Delacroix, however, starch is always present in tissues, giving rise to gum in *Prunus*, while it is absent in *Citrus*.

Historical.

The first studies on gummosis in stone fruits were made by Trécul in 1860, and he regarded the causal condition as rain.

In 1863, Wigand published a memoir on gummosis. He considered that gummosis was not itself a specific malady, but rather a symptom of weakness of the affected tissues.

In 1875, Prilleux, as the result of his investigations on the apricot, concluded that the gum filling vessels and cells was due to infiltration, and that no intermediate stages existed between gum and starch, though the former was probably derived from the latter.

In 1902, Aderhold made a number of inoculation experiments on cherry, apricot, peach, and plum trees with the "shot-hole" fungus, *Clasterosporium carpophilum*. The experiment proved quite decisive. Wounds inoculated with the fungus always produced gum, which usually pearled more or less upon the surface, sometimes even appearing in three days, whereas similar wounds uninoculated healed up normally.

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* Ormond Butler. A study on Gummosis of *Prunus* and *Citrus*, with observations on Squamosis and Exanthema of the *Citrus*. Annals of Botany, vol. 25, p. 107.

In 1906, Beijerinck and Rant published a memoir dealing very largely with the effect of stimuli on gum formation. They found that the peach and almond were very sensitive to wound stimuli, but the cherry, plum, and apricot were less responsive, and gummed less readily. Corrosive sublimate introduced into wounds and burns produced by focussing the sun's rays upon the shoots, acted as stimuli to gum formation.

In 1906, Mikosch also published an extensive article on gummosis of the cherry. He found that branches of plum, peach, apricot, and almond, when cut into short lengths and placed in water at room temperature, developed gummosis readily. He concluded, as a result of his studies, that gummosis was a pathological condition, due to the response of the cambium to wound stimuli.

In 1907, Ruhland, as the result of numerous experiments, advanced the opinion that gum formation was not due to wounds themselves, but to the fact that when deep enough they allowed air to penetrate the cambium, or to the young wood in process of formation. Oxygen from the atmosphere, he believed, was the active agent in gum formation. This gas acted upon the pectin and pectinates (substances very prevalent in ripening fruits), and upon the carbohydrates (sugar, starch) within the cells that should have gone to the building up of new septa, following cell division, oxidising them into gum. We may have gum formed *within* the cells (intracellular gum) and gum formed *between* the cells (intercellular gum). Ruhland regarded both kinds of gum as being formed through a process of oxidation. He showed that no gum was formed on cut surfaces if oxygen were excluded, by covering them over with paraffin wax or surrounding them with a mantle of an inert gas, such as nitrogen.

In 1909, Sorauer ascribed gum formation to a latent capacity possessed by embryonic and full-grown cells to produce gum.

Summarising these historical researches, we find gummosis to be attributed to rain, wounds, external stimuli, abnormal oxidation, and a latent capacity to produce gum.

Distribution.

Gummosis is known in France, Great Britain, Italy, Portugal, Spain, America, and Australia—generally speaking, wherever *Prunus* and *Citrus* are cultivated. While gummosis has seldom been a scourge in *Prunus*, several serious and devastating outbreaks are recorded in *Citrus*. The groves of New South Wales were seriously affected between 1860 and 1870.*

Influence of Soil and Water upon Gummosis.

According to Butler,† gummosis appears to arise within the plant, as well as to be super-induced by wounds of a very diverse nature. "Fungous, insectile, physical and chemical injuries, when they affect directly the cambium layer, will induce gummosis, provided growth is taking place. Furthermore, gum is not produced in quantities unless the tree affected is well

* Alderton, G. E. Treatise and Handbook of Orange Culture in Auckland, New Zealand.

† *Loc. cit.*

supplied with water. The development of the disease depends, then, upon the rapidity with which new tissues are being laid down at the time of its initiation; and this rapidity, as is well known, is a function, broadly speaking, of the amount of water available to the roots of the affected tree. Growth and water are, therefore, essential to the appearance of gummosis, and both are limiting factors."

The relation of these two factors, growth and water, to gum formation have to be borne in mind in considering any manifestation of gummosis. The conditions favourable to the development of gummosis are:—

(1) Growing trees in heavy, retentive, poorly-drained soils.
(2) Growing trees in an otherwise suitable soil, but underlaid by an impermeable subsoil, the situation not being such as to afford ample drainage.
(3) Irrigation methods allowing an excessive accumulation of water around the trees for a period of time.
(4) High fertility, combined with soil and drainage conditions, as mentioned under (1) and (2), and irrigation methods, as mentioned under (3).
(5) High fertility and excessive irrigation.
(6) Excessive manuring, especially with nitrogenous fertilisers.
(7) Continuous wet weather in spring.

Gummosis begins and attains a high state of development within the plant before any symptoms appear externally. Only after the gum has accumulated to such an extent that sufficient pressure has been produced to raise the epidermis, or to drive the gum in pearl-like drops through the crevices in the epidermis when it is no longer intact, does the disease become apparent. This is generally considered a young stage of gummosis, though in reality the disease may have developed very considerably by this time. Gummosis may affect a tree locally or generally; the fruit, the twigs and the smaller branches, one or more limbs, the trunk, or the entire tree may all be affected.

When gummosis progresses sufficiently for the gum to appear on the surface of the bark, the cortex in the neighbourhood of the exudate will be found more or less permeated with gum. The death of this infiltrated bark is but a matter of time; it becomes externally hard, cracks, curls more or less, and sloughs off. Severe cases of gummosis are always accompanied by depletion of green colouring matter in the leaves (chlorosis). This and other symptoms of disease are, doubtless, due to the blocking up of the avenues along which food supplies travel. Cross-sections show that the diseased tissue is situated in the young wood, and in young wood in formation. Diseased areas seen in the older wood are due to attacks of gummosis at some previous period.

Origin of the Gum.

There is considerable lack of agreement among authors in their answer to the question—Where and how does the gum originate? So far from regarding starch as a precursor of gum, Butler holds the view that "the cell contents take no part in the initial stages of gummosis; it will be shown, as

we proceed, that they remain passive at all times. The cell wall, on the other hand, is the seat of the malady *ab initio* and throughout its subsequent development." The experimental evidence that he brings forward, however, is not, to our minds, convincing. According to Butler, gummosis is due to the dissolution by hydrolysis (combination with water) of the walls of the embryonic wood. There seems to be, first, a swelling, followed by a gelatinisation of the primary membrane. Both the primary and secondary membranes of the cell wall are rendered semi-fluid by a further absorption of water. The resulting solution collects between contiguous cells, and as a result, they are detached from each other. The gumming mass is, therefore, a mixture of the hydrolyzed cell-walls and the protoplasm of the disorganised cells.

This view is strongly attacked by F. A. Wolf.* There is much reason for thinking that gummosis is produced by a ferment (cytase) that escapes from the injured or degenerate cells, and attacks the walls of the adjacent healthy cells. There is a vast accumulation of evidence that such ferments exist in plants, in cases which are comparable with gummosis, and there is no reason to suppose that a ferment or enzyme is not at work here.

Sorauer† considers that there is a tendency to gumming degeneration in the cherry-tree, and that stimuli, such as frost and wounds, only accentuate a natural tendency. Generally speaking, cells having the tendency to gummosis are deficient in starch, are thin walled, and have heavy deposits of tannin and phloroglucin ; in a word, they are cells which fail to mature. The cause of degeneration may be regarded as an excess of ferments or enzymes. Degeneration in the individual cell starts in the cell contents and extends to the secondary membrane, which swells and furnishes the chief material for the gum. As the gummosis extends to adjacent cells, the order, is, of course, reversed—the intercellular substance being first attacked, and the cell contents last.

In a later paper, Sorauer‡ comes to the conclusion that certain experiments that he has carried out upon cherry-trees show that the irritation theory, according to which only wounds cause gummosis, is not correct in this form. A wound can certainly produce gummosis, but many wounds are not accompanied by gummosis. On the other hand, this disease appears also on spots that have not been in any way wounded. A wound, according to Sorauer's observations, caused a considerable afflux of protoplasmic matter towards the tissues that it has laid bare and to the neighbouring parts, which thus acquire the character of young growth necessary for the formation of callus tissue. This flow of protoplasm leads, however, at the same time, to an accumulation of the ferments (enzymes), present in all young tissues ; of these, the cytases (cell-wall dissolving ferments) appear first, while the coagulases (precipitating ferments) increase only gradually.

* Frederick A. Wolf. Gummosis. The Plant World, vol. 15, No. 3, p. 60.

† Bot. Gaz., 54–2, p. 173, Aug., 1912. Reference to two papers by Sorauer, Landwirtsch. Jahrb, 39, 259–297, 1910; Ibid 41, 131–162, 1911.

‡ Monthly Bulletin of Agricultural Intelligence and Plant Diseases. Year V, No. 8, page 1085. Ref. to paper by Sorauer. Landwirtschäftliche Jahrbücher, vol. xlvi, Part 2. April, 1914.

If these enzymes find their natural employment, as is the case in every young, normally-growing part of a plant, in which there is sufficient formation of new cells, no anomalies are caused, and consequently no gummosis spots are produced on the new bark that is formed. But if, for any reason, an unfavourable ratio is set up between the quantities of enzymes flowing in and their utilization, resulting in an excess of cytase, then gummosis follows. Where the bark near a wound is still intact upon a tree, it will exert a certain amount of pressure, and will thus hinder, to a certain extent, the increase of new cells beneath it; here cytase is liable to accumulate, and result in outbreaks of gummosis. Close to the wound these outbreaks are smaller, because the formation of wood and of new cells increases, and the enzymes are utilised to a greater extent. The remedy of cutting the bark in a spiral direction for a tree affected with gummosis, to be referred to later, finds here a partial explanation.

Causes of Gummosis.

Whatever may be the origin of the gum—and we incline to the view that it is due to special enzyme activity asserting itself owing to a disturbance of the equilibrium of the cell, induced by the presence of too much water, or to external stimuli—there can be no doubt that, broadly speaking, *Prunus* and *Citrus* are susceptible to gummosis whenever conditions are favourable for active growth of cambium. A plant that forms gum, without having suffered external injury, is generally found to be suffering through an excess of water in the substratum at the time of vigorous growth.

As regards gummosis produced by external factors, provided the plant is in the proper condition, almost any external injury will produce the malady. Among the most common agents are :—

(1) Various forms of parasitic fungi—*e.g.*, in New South Wales we have *Clasterosporium carpophilum, Monilia fructigena, Exoascus deformans.*
(2) Various bacteria.
(3) Boring and gnawing insects or their larvæ.
(4) Wounds due to pruning, hailstones, accidental abrasions, burning, freezing, or chemical agents.
(5) Unequal growth between stock and scion, or planting the trees in such a manner that the union between stock and scion occurs below ground.

Remedial and Preventive Measures.

When gummosis has been determined to be due to an external agency, coming under one or other of the five headings enumerated above, the remedy will suggest itself. Space will not admit our going into details here.

As excess of water in the substratum at the time of rapid growth is the other main cause of gumming (the so-called autogenous gummosis) the remedy is drainage.

"The chief preventive measure for autogenous gummosis is drainage, and where irrigation is practised, more rational distribution of water. In draining

an orchard, or land intended for an orchard, care should be taken to make the drainage efficient; but whether this shall be accomplished by tile draining, open ditches, by growing the trees on ridges, or by combining two or more of these methods, is a question which the grower must solve for himself. We may observe, however, that excessive humidity being harmful as regards gummosis only during the vegetative period, it is quite evident that the distribution of the rainfall throughout the year will have to be considered in planning a drainage system. As regards moisture, the grower should aim at maintaining in his soil the proper moisture for growth by frequent irrigations. Infrequent and copious irrigations should be avoided, as they produce recurrent periods of saturation favourable to the development of gummosis, which, under such a cultural regimen, if once induced, is particularly difficult to cure. In heavy retentive soils flooding ought never to be used, and should be replaced, where employed, by a furrow system of irrigation. In light, well-drained soils flooding may, of course, be used without danger, which is fortunate, as frequently it is the only satisfactory method of irrigating for such soils."*

Other remedies that have been suggested are:—

(1) The use of resistant stocks. We have little knowledge of the relative resistability of *Citrus*, however, and apparently absolutely none as regards *Prunus*.

(2) Root pruning. This is liable to result in complications if injudiciously carried out.

(3) The application of lime. This flocculates the clay particles in soil, and, therefore, produces increased porosity and indirectly better drainage. Salt applied to peach-trees, at the rate of 2 lb. per tree, has proved highly beneficial in some experiments.

(4) High budding. "The fact that high budding in itself is capable of ensuring relative immunity to gummosis, even when the stock used is of low resistance, does not appear to have been sufficiently emphasized."

(5) When a tree is suffering from general gummosis, slitting the bark for some distance spirally may be practised.

(6) Where a large amount of gumming exudate is present, only this and the contiguous *dead* bark should be removed. The cambium should not be removed, as it is capable, so long as it remains alive, of laying down fresh wood and thus covering up susceptible tissues.

We have dealt here with the nature and cause of gummosis without going into minute details in connection with the degeneration of the cells. A review of the whole case leads to but one conclusion, viz., that the one great capital preventive measure for gummosis, to be applied when laying out an orchard, is proper attention to drainage; and the one supremely important remedial measure for gummosis, to be applied to an orchard already established, is again proper attention to drainage.

* O. Butler. *Loc. cit.*

A Descriptive Catalogue of the Scale Insects ("Coccidae") of Australia.

[Continued from Vol. XXV, page 989.]

WALTER W. FROGGATT, F.L.S., Government Entomologist.

SUB-FAMILY II., *Lecaniinæ*.

THE scale insects included in this division are distinguished from the members of the last sub-family in the females having the posterior extremity of the abdomen cleft. "The anal orifice closed above by an operculum, consisting typically of a pair of triangular hinged plates (the anal plates or anal scales), forming a valve" (Green). The adult female in the typical group (*Lecanium*) is naked, and furnished with legs and antennæ; in others it is covered with waxy, glassy, horny, cottony or felted secretions, and the legs may be rudimentary or wanting. The Lecanid larvæ are active little creatures, with well developed legs and antennæ, showing the anal cleft of the abdomen and a stout seta on either side.

Though attaching themselves to the bark or leaf surface of their food plant, both the larvæ and the females, in the early stages of development in some of the groups, can move from place to place, and frequently do so when their food-plant has been gathered and begins to dry. The adult female coccid, naked or covered, deposits her eggs in masses between herself and the bark upon which she is feeding, the contraction of the abdominal segments forming a regular cavity in which the eggs and freshly hatched larvæ are protected until the latter emerge from beneath the dried-up remains of the female. The male larvæ, as they develop in many of the genera, construct glassy angulated or ribbed coverings within which they pupate. In some groups male puparia are very rare, in others they are unknown.

This sub-family is well represented in Australia by many fine native species peculiar to the country, and most of the cosmopolitan genera, such as the brown olive scale and the Indian wax scales, have been accidentally introduced with their food-plants, and are now well established in our orchards and gardens.

The following genera are represented in Australia:—XIII, Ceronema; XIV, Pulvinaria; XV, Tectopulvinaria; XVI, Lichtensia; XVII, Signoretia; XVIII, Ceroplastes; XIX, Ctenochiton; XX, Inglisia; XXI, Ceroplastodes; XXII, Lecanium; XXIII, Cryptes; XXIV, Alcerda.

Genus XIII. *Ceronema*, Maskell.

Trans. N. Zealand Inst., Vol. xxvii., p. 55, 1894.
Cockerell, *Canadian Entomologist*, Vol. xxxi., p. 330, 1899.

This genus was formed by Maskell for an Australian coccid that is allied to Pulvinaria. He says: "Adult female covered wholly or partially by tests of threads more or less closely woven, neither glassy, cottony or felted. Never forming homogeneous plates, no fringe. Lecanid in form, with normal cleft and lobes. Male scale covered by a glassy test of normal Lecanid form, comprised of plates more or less homogeneous."

Cockerell supplements this in his "Tables for the determination of the genera of Coccidae." Female secreting a thick mass of white waxy threads, which, however, do not cover the middle of the back; round the sides are threads spreading in all directions; antennæ six-jointed, third much the longest; legs rather slender, tibiæ longer than tarsi. Two species have been described from Australia; another has been described from China and Japan upon the tea plant, by Maskell; and a fourth upon the tea plant in Ceylon. I have another very handsome, large species upon the foliage of eucalypts in New South Wales.

Ceronema banksiæ, Maskell (Plate VIII, Figs. 1 and 2).

Trans. N. Zealand Inst., vol. xxvii, p. 56, pl. iv., figs. 1–13, 1894.

This insect was found by me upon the leaves of *Banksia serrata*, the common "honeysuckle" of our coast, in the vicinity of Manly, N S.W. It is a rare scale, and I have only found it three or four times in all my collecting. Fuller says that this species is found on three different species of Banksias in West Australia.

The test or covering of the adult female is white, nearly one-third of an inch in length, broadly rounded, oval, the outer margins consisting of fine hairs resting on the surface of the leaf, with the rest forming two rolls of white waxy threads, or rather strands, folding over on either side with a parallel cleft down the centre like the parting in a man's hair, but brushed round on either side.

The adult female is therefore hidden, except down the centre of the back; she is dark, reddish brown, about one-eighth of an inch in length, oval, slightly convex, with the centre of the back smooth, but either side thickly marked with oval pores, and the outer margin of the body fringed with fine hairs. Furnished with six-jointed antennæ and small feet. The male puparium is silvery white, slender elliptical, $\frac{1}{10}$ inch in length, beautifully striated, marked with a triangular plate at both extremities.

630. *Ceronema banksiæ.* Cat. Coccidæ, p. 127.

Ceronema caudata, n.sp. (Plate VIII, Fig. 3).

This species has been obtained by me on several occasions in the foliage of *Eucalyptus robusta* at Thirroul on the South Coast, and at Lake Toronto, near Newcastle. The felted secretionary covering is much more abundant

than in *C. banksiæ*, the strands, thickened and well defined, curling round on either side and at the anal extremity, forming regular curled strands, two of which curving outward coalesce and turning back merge into the other mass forming a curled tail like the handle of a teapot. The filamentous strands are so thick on the dorsal surface that they almost touch down the centre of the back, and the regular parting is indistinct.

The general shape is broadly, irregularly round, the secretion forming rounded irregular masses on the flattened summit. Length and diameter up to ¼ inch, the curled handle or tail projecting another ⅛ inch behind.

The male test, elongate, oval, semi-transparent, white, with a yellow tint from the presence of the enclosed larval male coccid. The outer margins finely crenulated and the dorsal surface formed of glassy plates forming a slender lanceolate pattern, slightly under ⅛ inch in length. The adult female, reddish brown, with the outer margins lighter, broadly oval, convex, with the anal cleft very distinct, length about ⅛ inch.

Ceronema dryandræ, Fuller.

Journal of Dept. of Agriculture, W. Australia, vol. iv., p. 1345, 1897.
Trans. Ent. Soc., London, p. 460, 1899.

Fuller says: "A species closely allied to *C. banksiæ*, but handsomer and easily distinguished by the form of the test, which covers the whole of the dorsum excepting a small elliptical spot towards one end. Taken upon *Dryandra florabunda and D. nivea*, near Perth, West Australia."

631. *Ceronema dryandræ.* Cat. Coccidæ, p. 127.

Genus XIV, *Pulvinaria*, Targioni-Tozzetti.

Catalogue, 1869, p. 34.
Signoret, *Ann. Soc. Ent. France*, vol. iii., p. 29, 1873.
Newstead, *Mon. British Coccidæ*, vol. ii, p. 50, 1903.

The members of this genus are closely allied to those of the last. In the earlier stages of the development of the female and during the whole of the life-history of the male coccid they do not show any structural differences. The adult female, however, when laying her eggs produces a wad of fine filaments beneath, and often surrounding, but never completely enveloping her on the dorsal surface.

Newstead says: "Adult females naked, ovisac secreted at period of parturition not enveloping the insect. Puparium of male inseparable from the puparia of Lecanium."

Sixty-one species are listed from all parts of the world, and are found upon all kinds of trees, shrubs, and even small plants. They are well represented in Australia.

Pulvinaria contexta, n.sp.

Specimens obtained at Mittagong, New South Wales, upon the twigs of *Bossiaea*, sp., and *Dillwynia juniperina.*

Adult female resting against the irregularly rounded ovisac, composed of felted white filaments without any regular structure, usually half hidden

with the loose woolly matter in front. Length of female and ovisac, $\frac{1}{4}$ inch. General colour, brown. Treated with potash, transparent; cephalic portion slightly contracted, rest broadly oval, with the anal segments rounded at the tips, and a very slight shallow anal cleft; no marginal spines, and epidermis appears to be finely shagreened. Legs, slender; antennæ slender, rather long.

Male puparium composed of white crystalline plates, forming a slender box flattened on the dorsal surface with two parallel striæ meeting at the extremities; the ends truncate above, rounded on the margin; sides sloping down, divided into sections by six fine white transverse lines or ridges. Length, just under $\frac{1}{10}$ inch.

Pulvinaria darwiniensis, n.sp.

The type specimens were collected by Mr. F. G. Hill upon *Caladium*, sp., growing near Port Darwin, Northern Territory. This is a well defined species, though the females are not quite adult.

Female dull yellow, central portion darkest, margins lightest, resting upon a pad of soft white woolly secretion, with the ovisacs pure white composed of soft woolly filaments without any defined pattern extending beyond; the female slightly broader, round to the apex. Length of female, $\frac{1}{10}$ inch; with ovisac, $\frac{1}{5}$ inch.

Female broadly elongate; rounded at both extremites; slightly contracted at cephalic portion; somewhat flattened, probably convex when alive; anal segment broadly divided by a wedge-shaped cleft; anal opening apparently large. Antennæ long, slender, eight-jointed; first short, broad; second and third nearly uniform; fourth to seventh tapering, with the eighth slightly longer and pointed; legs well developed; thighs of fore pair large, tarsal joint long, tarsal claw large.

Pulvinaria dodonææ, Maskell.

Trans. N. Zealand Inst., vol. xxv., p. 222, pl. xiii., figs. 8-9, 1892.

This coccid was described from South Australia upon the foliage of *Dodonæa bursarifolia* and *Myoporum*, sp.

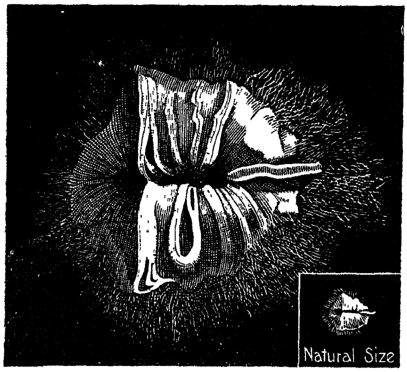
Maskell says: "The adult female is reddish brown, darkening with age. Before gestation the form is regularly elliptical, flattish or slightly convex, and has the appearance of a full grown *Lecanium;* as she shrivels up she simply becomes a brown speck in a mass of cottony secretion. The variations in size and colour render it somewhat difficult to identify. Adult female, $\frac{1}{8}$ to $\frac{1}{20}$ inch in length; ovisac, $\frac{1}{9}$ inch.

656. *Pulvinaria dodonææ*. Cat. Coccidæ, p. 132.

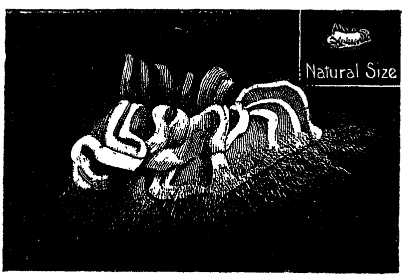
Pulvinaria flavicans, Maskell.

Trans. Royal Society, S. Australia, p. 103, pl. xii., f. 3. 1888.
Cockerell, *Pro. Academy, Nat. Sciences, Phil.*, p. 272. 1899.

Specimens described on the foliage of an undetermined native plant from South Australia.

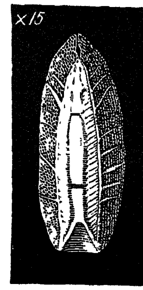


a) Dorsal view.

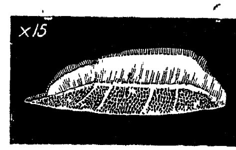


(b) Side view.

Fig 1.—*Ceronema banksiæ.* Female.



(a) Dorsal view.

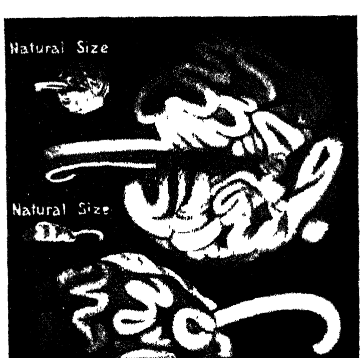


(b) Side view.

Fig. 2—*Ceronema banksiæ.* Male.

(a)

(b)



(a) Dorsal view.

(b) Side view.

Fig. 3.—*Ceronema caudata*, n.sp.

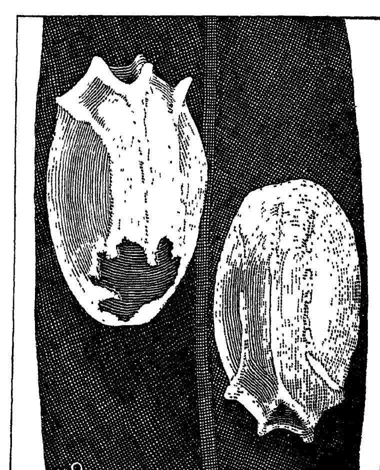
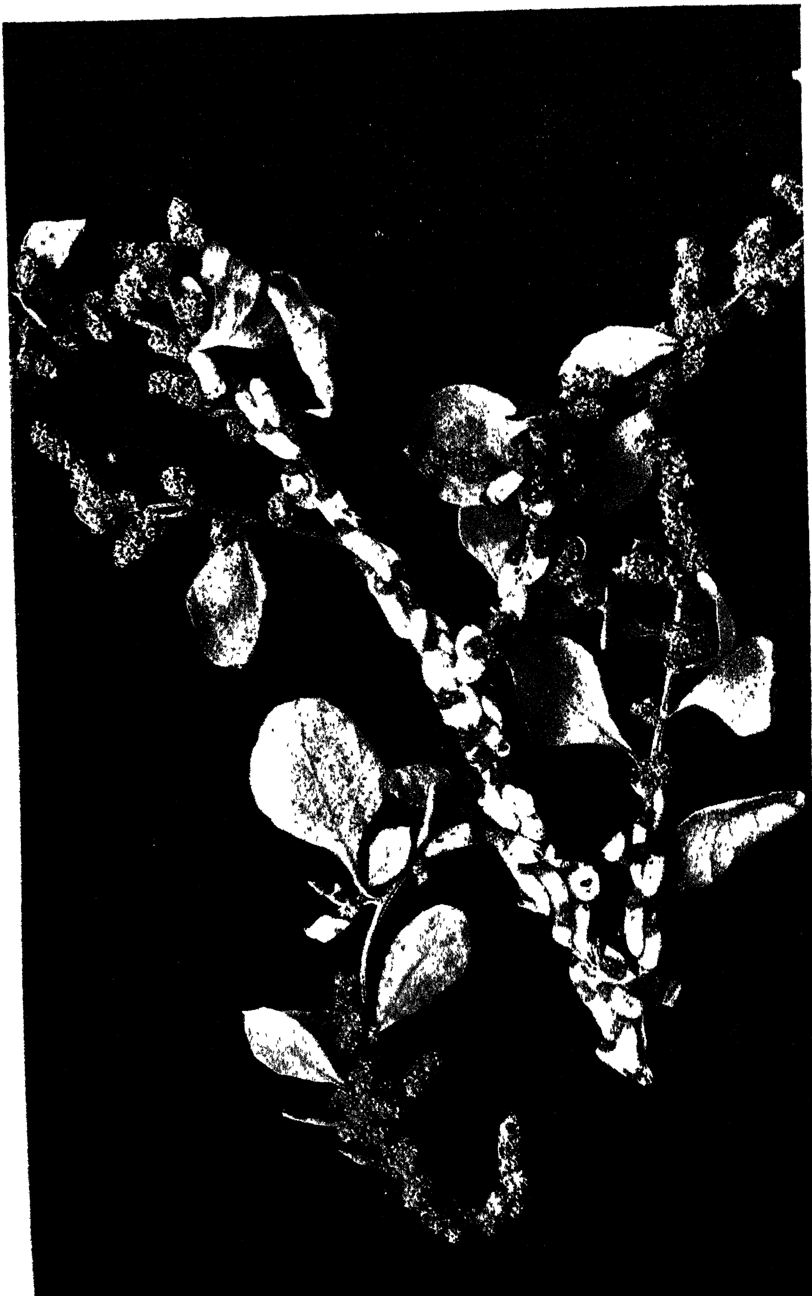


Fig. 4.—*Pulvinaria greeni*, n.sp.



Pulvinaria maskelli, Olliff.

SCALE INSECTS OF AUSTRALIA. Plate IX.

"Adult female yellowish brown, not globular or gall-like, slightly convex, rugose, outline sub-elliptical, naked, but producing an ovisac, upon which it rests. A fringe of short spines, very close together, right round the margin. Antennæ apparently eight-jointed. Legs well developed."

660. *Pulvinaria flavicans.* Cat. Coccidæ, p. 132.

Pulvinaria floccifera, Westwood.

Gardeners' Chronicle, p. 308, f. 52. 1870.
Newstead, *Mon. British Coccidæ*, vol. ii., p. 9, pl. ii, figs. 6 7. 1902.
Pulvinaria camelicola, Sign. *Ann. Soc. Ent. France*, vol. iii, p. 32. 1873.
" *phaiæ*, King. *Entomological News*, p. 311. 1899.
" *brassiæ*, Ckll. *Canadian Entomologist*, p. 135. 1895.

This is an introduced species, recorded from New Zealand and Australia; almost cosmopolitan in its range, on many garden shrubs, such as *Camellia, Euonymus, Brassia, Phaius*, &c.

It is the common hothouse scale in England and France, appearing on the underside of the leaves, where, after the adult female has deposited her eggs, she usually shrivels up and, falling off, leaves behind her the white cottony ovisac enveloping the eggs.

Newstead says: "Adult female in life distinctly cordate, but becoming more wrinkled after gestation. Colour pale yellow; lower half of the body mottled with reddish brown or brightly ochreous; 2-3 mm. in length." The ovisac, either curved or straight, is usually five to eight times the length of coccid.

661. *Pulvinaria floccifera.* Cat. Coccidae, p. 132.

Pulvinaria greeni, n.sp. (Plate VIII, Fig. 4).

This fine species comes from Condobolin, New South Wales, infesting one of our inland scrub trees (*Myoporum deserti*). I have named it in honour of Mr. E. E. Green, who has assisted me so much in this work.

Adult female after gestation buried in the ovisac, measuring, with the surrounding ovisac, $\frac{1}{8}$ inch. Much wrinkled, yellowish brown, mottled with reddish brown; ovisac white, projecting behind the coccid, broadly oval and convex, with the cottony secretion forming three distinct parallel ridges behind her. Immature female, semi-transparent to yellowish green, oval convex, broadest in front, the outer margins finely crenulated. Male puparium semi-transparent, white, forming a regular elongate box, the sides angled and the dorsal surface flat, the front sharply acute. Length, $\frac{1}{10}$ inch. Allied to *Pulvinaria dodonææ*, but the structure of the male puparium is very different.

Pulvinaria maskelli, Olliff. (Plate IX.)

Agric. Gazette, N. S. Wales, vol. ii., p. 667, 1891, and vol. iii., pl. iv., f. 8, p. 176, 1892.
Signoretia atriplices, Mask. *Trans. N. Zealand Inst.*, vol. xxiv., p. 23, 1892.
Pulvinaria maskelli, Mask. *Trans. N. Zealand Inst.*, vol. xxvii, p. 76, 1893.
Pulvinaria maskelli, var. *spinosior*, *Trans. N. Zealand Inst.*, p. 78, 1902.

This is the common scale upon several species of *Atriplex* and *Rhagodia* ("saltbushes"), valuable fodder plants that cover immense areas in the

inland districts of Australia. When plentiful, the scale spreads all over the leaves and branchlets, and does a great deal of damage to the host plant.

Adult female with ovisac measuring up to ½ inch in length, but usually smaller, the coccid reddish brown to lighter yellowish tints; elongate, ovate, convex above, very much wrinkled and narrow in front in dried specimens, with the hind margins fitting round the front margin of the ovisac in wrinkled shell-like plates; without the ovisac, about ⅛ inch in length. Antennæ eight-jointed; third and fourth longest; legs well developed; the margin of the body showing small spines; the epidermis covered with a great number of tubular spinnerets. Ovisac white, compact, cylindrical, showing very slight parallel impressions, front margins fitting close to the female; apex rounded.

Male puparium composed of white waxy secretion, elongate, ovate in form, convex, and truncate behind; the anal setae of the delicate two-winged male sticking out through the hole in the centre of this flattened lid or cover.

This soft scale is fortunately infested by a number of active parasites that keep it in check; among them is the small green lace-wing *Chrysopha rumburi*, and several species of the larvæ of the scale-eating moths of the genus *Thalpocharis*.

Maskell has described a second form under the name of var. *spinosior*. It was found upon the foliage of the Desert Cypress (*Frenella robusta*), and differs in the typical form in the more narrow ovisac and the large spines on the margins of the body. Other specimens of this variety come from Richmond, New South Wales, found upon a Pittosporum.

Mr. C. French, junr., sends me small specimens of this variety on the stems of *Hymenanthera dentata* from the Mallee scrub, North-west Victoria.

672. *Pulvinaria maskelli.* Cat. Coccidæ, p. 135.

Pulvinaria nuytsiæ, Maskell.

Trans. N Zealand Inst., vol. xxix, p. 313. 1897.
Pulvinaria nuytsiæ, *Trans. Ent. Soc., London*, p. 458. 1899.
Ctenochiton nuytsia, Fuller, *Journ. of Dep. of Agriculture, West Australia*, 1897, p. 1345.

Described from specimens collected on the foliage and twigs of *Nuytsia floribunda*, Perth, West Australia. Fuller described the male scales as *Ctenochiton*, but corrected his mistake in the later paper. Fuller also described an allied form under the varietal name of *P. maskelli* var. *viminaria*, upon the twigs of *Viminaria denudata*, and *Hakea ilicifolia* from the neighbourhood of Perth, West Australia.

Adult female dark brown; elliptical in form when alive, much wrinkled when dead. Ovisac elongate, narrow, composed of felted white cotton. Length of female, $\frac{1}{18}$ inch, ovisac ¼ inch. A median ridge down the centre of the dorsum, margins flattened. Antennæ eight-jointed; third longest, last three sub-equal, with long hairs at the tip. Fringed with fine blunt spines round the margins. Maskell says it is allied to *Pulvinaria maskelli*, var. *spinosior*, but besides its smaller size it differs in the feet, marginal spines and dorsal elevation.

Fig. 1.—*Pulvinaria newmani*, n.sp.

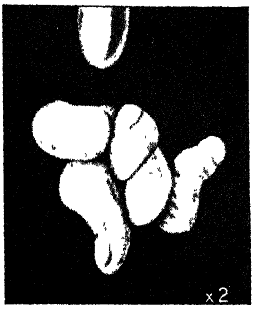


Fig. 3—*Pulvinaria theæ*, n.sp.

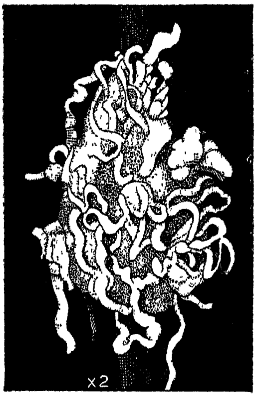


Fig. 2.—*Pulvinaria tecta.*

Fig. 4.—*Ceroplastes ceriferus*

Scale Insects of Australia. Plate X.

Ceroplastes rubens.

SCALE INSECTS OF AUSTRALIA. Plate XI.

In Mrs. Fernald's catalogue this species is simply made a variety; but I see no reason for sinking its rank.

Pulvinaria newmani, n.sp. (Plate X., Fig. 1).

This fine species was collected in the Harvey district, West Australia, by Mr. L. J. Newman, upon the twigs of an undetermined species of *Jacksonia.*

Adult females thickly encrusting the twigs and branchlets. Length, with ovisac, just under ½ inch; adult female without ovisac, after treatment in potash, over ⅓ inch in length, but only $\frac{1}{10}$ inch when dried against the ovisac. Dull reddish brown, broadly oval, rounded in front, constricted behind cephalic portion on either side, swelling out to anal segment, which is deeply cleft with the extremities on either side rounded. Antennæ seven-jointed; first short broad, second longest, third and fourth equal, fifth to seventh smaller. Rostrum well developed. Legs stout, thighs thickened, tibiæ stout at base. Whole surface covered with fine scattered spines, with a distinct fringe right round the outer margin of stout short spines.

The ovisac is composed of felted white cottony secretion, which is waved with fine transverse impressions or in others slight parallel striæ. General form cylindrical, truncate in front where in contact with coccid, but rounded on the apex.

Allied to *Pulvinaria maskelli*, but differing in the larger size. Only seven joints in the antennæ, and constricted on the sides of the thoracic segments.

Pulvinaria paradelpha, Cockerell and Lidgett.

Victorian Naturalist, vol. xvi., p. 17. 1899.

The type was found upon the foliage of a wattle (*Acacia melanoxylon*) at Mount Difficult, Grampians, Victoria.

Adult female light brown, oval, margins almost spineless; antennæ eight-jointed; mouth parts small. Ovisac white, broad, flat, leathery. Length of coccid ⅙ inch; with ovisac, under ½ inch.

Allied to *P. thompsoni*, described from Tasmania by Maskell.

678. *Pulvinaria paradelpha.* Cat. Coccidæ, p. 137.

Pulvinaria salicorniæ.

This coccid was found by Mr. C. French, junr., upon the foliage of an undetermined species of *Salicornia*, growing at Little River, Victoria. The adult female is reddish brown, with the outer margins lighter coloured; general form broadly rounded, convex, and wrinkled when dry on the dorsal surface, concave beneath; no distinctive structure after treatment with potash; antennæ small, six or seven jointed; first joint broad, short, second shorter than the third; terminal one small; legs moderate; anal segment round on either side, with the angulated processes on either side of the anal opening large. Length, ⅛ inch.

Ovisac composed of soft white woolly filaments forming a pad upon which the coccid rests, and extending into a round mass behind; the margin of the

coccid is often buried in the woolly secretion, so that only the back shows. Length, with coccid, $\frac{1}{5}$ inch. The species was determined and given the above MS. name by Mr. E. E. Green, and was given to me at his suggestion by Mr. C. French, jun.

Pulvinaria tecta, Maskell. (Plate X, Fig. 2).

Trans. N. Zealand Inst., vol. xxvi., p. 79, pl. iv., figs. 9–14, 1893, and vol. xxviii, p. 393. 1896.
Cockerell Bull. 4 *Tech. Series. U.S. Dept. Agr.*, p. 49. 1896.

This is one of the commonest woolly coccids in the vicinity of Sydney and along the coast, being found chiefly upon the branchlets of *Kunzea capitata* and other species of this genus. So thickly does it infest the small twigs that they are often completely enveloped for inches with balls of white loose filaments. It has been recorded upon another native shrub (*Daviesia, spp.*) and upon the orange, but I have never seen it upon any citrus tree.

The adult female varies from dull yellow to dark reddish brown; general form oval, slightly convex; firmly attached to the bark of the twig; enveloped in the ovisac, which consists of loose, cottony, matted filaments, somewhat curled and felted, irregularly rounded, measuring often $\frac{1}{2}$ inch in diameter. The enclosed adult coccid measures about $\frac{1}{8}$ inch.

Maskell says: " I cannot say that this species entirely agrees with the usual type of *Pulvinaria*, because it is by no means easy to distinguish clearly the insect, so much is it surrounded by the cottony mass; yet I cannot declare that it is entirely embedded. If it were so, it would probably have to be placed in the genus *Signoretia*, but it seems to suit *Pulvinaria* best. It is another instance of a species on the border line of two genera.

688. *Pulvinaria tecta*. Cat. Coccidæ, p. 139.

Pulvinaria thompsoni, Maskell.

Trans. N. Zealand Inst., vol. xxvii., p. 39[illegible], pl. x[illegible], figs. 1-8. 1[illegible].

The type specimens come from Hobart, Tasmania, where they were collected upon the foliage of the Native Hop Bush (*Dodonæa viscosa*). " It differs from the species found upon another species of *Dodonæa* in South Australia in structural details in having eight-jointed antennæ, larger digitules of the claw, in the very small number of dermal spinnerets, in the spines of the marginal depression, in size and colour."

The adult female varies from yellow to reddish brown, general form elliptical, flattish, margin with a row of fine hairs set rather closely together; each of the marginal depressions with three or four stout club-shaped spines. Length, $\frac{1}{6}$ inch. Specimens often massed together, the twigs covered with filaments. Male puparium white crystalline, angular elliptical, sides sloping, top flattened. Length, $\frac{1}{12}$ inch.

690. *Pulvinaria thompsoni*. Cat. Coccidæ, p. 139.

Pulvinaria theæ, n.sp. (Plate X, Fig. 3).

Found upon the foliage of a tea plant (*Thea viridis*) growing in a garden at Richmond, New South Wales (Mr. C. T. Musson).

Adult female yellowish brown; when cleared with oil of cloves it appears to be pale yellow, blotched with brown; the outer margins semi-transparent, marbled with yellow lines, giving it a tesselated pattern. Length, ⅛ inch. Anal aperture very distinct, with anal cleft rounded on either side. Legs and antennæ indistinct.

Ovisac pure white, elongate, sub-cylindrical, broadly rounded behind, the filaments showing a fluted structure with a delicate transverse wave, like a bit of merino wool. Length, nearly ½ inch.

Genus XV. *Tectopulvinaria*, Hempel.

Revista do Musea Paulista, vol. iv., p. 482. 1900.
Annals and Magazine Nat History. vol. viii., p. 69. 1901.

The type of this genus (*T. albata*) was described from Brazil. This is the second species from Australia on Mr. E. E. Green's determination. "Adult female secreting an ovisac as in *Pulvinaria*. Dorsum entirely covered with a white felted cotton-like secretion; antennæ eight-jointed. Male scale thin, white, narrow, elliptical, covered with a fine white secretion." (Cockerell.)

Tectopulvinaria loranthi, n.sp.

The specimens were obtained near Ryde, New South Wales, upon the foliage of a *Loranthus*, parasitic upon an undetermined species of *Eucalyptus* (Mr. J. J. Fletcher).

Adult female completely hidden by a smooth, closely felted, white ovisac, fitting close against the surface of the leaf; elongate, oval, convex, measuring, with ovisac, ⅓ inch in length; much longer than broad.

Adult female, removed from ovisac, yellowish brown; nearly ⅓ inch in length; broadly oval, cephalic portion broadly rounded in front, showing fine close short filaments, that may cover the whole of the dorsal surface. The central portion or sides of the thoracic segments cut into with two deep keyhole-like incisions on either side (widely apart from each other); round on the inner edge, with a fringe of four or more short brown bristles. Legs and antennæ indistinct; mouth parts prominent; rostrum long and distinct; anal segment deeply cleft, which runs back into a rounded base, widening out and giving the extremities of the anal segment an angular form. Larva light yellow, rounded, massed together under the female in a quantity of short woolly particles.

Genus XVI, *Lichtensia*, Signoret.

Ann. Soc. Ent. France, vol. iii., p. 497. 1873.
Newstead, *Mon. British Coccidæ*, vol. ii, p. 32, 1902.
Cockerell, *Canadian Entomologist*, vol. xxxi, p. 331. 1899.
Austrolichtensia, Cockerell, *Ann. and Mag. N.H. London*, vol. ix., p. 331. 1902.

This genus was formed by Signoret for a coccid (*L. virburni*), found in gardens in Europe on several common shrubs. Thirteen species have been described Mexico, South America, and Egypt.

Newstead defines the genus as follows: "Adult female naked and more or less active up to the period of parturition, when it much resembles certain

forms of *Lecanium hesperidum.* Immediately before this stage the female envelopes herself, except the cephalic portion, in a dense white felted sac. Antennæ and legs well developed. Male coccid with two long white caudal filaments, and four dorsal and four ventral ocelli. Male puparium glassy, with the coronet bifurcate at the posterior extremity."

The members of this genus only differ from those in the succeeding genus (*Signoretia*) in the structure of the males and their puparia; there is no difference in the females of the two genera.

Lichtensia hakearum, Fuller.

Lecaniodaspis? hakearum, Journal Agr. West Australia, August, 1897, p. 1345.
Lichtensia hakearum, Trans. Ent. Soc. London, p. 457, 1899, pl. xv., fig. 3.
Austrolichtensia hakearum, Cockerell. *Ann. and Mag. N. Hist.* (7), vol. ix., p. 451. 1902.

This species was found in West Australia upon *Hakea media* and another undetermined species at Pinjarrah, West Australia. In his first notice, Fuller placed it in the genus *Lecaniodaspis.*

Adult female brown, convex, enfolded in a spherical sac of white felted secretion; open at the anterior end, exposing the centre of the back; anal cleft small; anal ring with six hairs. Antennæ seven-jointed, legs well developed; epidermis with protruding multilocular spinnerets. Length 0·15 inch. (Fuller.)

705. *Austrolichtensia hakearum.* Cat. Coccidæ, p. 142.

Genus XVII. *Signoretia*, Targioni-Tozzetti.

Catalogue, p. 34. 1869.
Newstead, Mon. British Coccidæ. vol. ii., p. 26. 1902.
Luzulaspis, Cockerell, *Ann. and Mag. N. H.*, vol. ix., p. 25. 1902.

This genus was created by Targioni-Tozzetti for the reception of a coccid, which Dufour has described under the name of *Aspidiotus luzulæ.* Cockerell has created a new genus (*Luzulaspis*) for this insect. I follow Newstead, who has retained the second name.

Newstead says: " Adult female narrowly elongate; antennæ eight-jointed, and legs well developed. Anal ring with six hairs. Ovisac of female very elongate, sometimes clavate, closely felted, and open at the narrow anterior extremity. Male with short styliform genital armature. No caudal filaments. Male puparium glassy, elongate, with the ends rounded and rather deep; perpendicular sides, which give it a somewhat box-shaped form."

Signoretia luzulæ, Dufour.

Aspidiotus? luzulæ, Ann. Soc. Ent. France, vol. iv., p. 208, pl. 5, p. 4. 1864.
Signoretia clypeata, Targ.-Tozz. Catalogue, p. 34. 1869.
" *luzulæ,* Sign. *Ann. Soc. Ent. France* (5), vol. i., p. 427. 1871.
" " Maskell, *Trans. N. Zealand Inst.*, vol. xxvi., p. 80. 1893.
" " *var. australis, Ibid.*, vol. xxvi., p. 80. 1893.
" " " " Fuller, *Trans. Ent. Soc. London,* p. 457. 1899.
Newstead, *Mon. British Coccidæ,* vol. ii, p. 27, pl. xl., figs. 1–12. 1902.

The typical form of this genus was originally described from France and England upon several species of rushes, belonging to the genus *Luzula.*

In 1892, Maskell determined specimens, probably introduced from Europe, upon grass collected at Nevertire, New South Wales. In the following year he suggested, chiefly on account of its greater size, that it might be defined as var. *australis*. Fuller recorded the identification of this species upon a sedge in Western Australia in 1899.

Adult female yellowish brown, enclosed in a narrow elongated convex sac, composed of closely felted white cotton. Antennæ eight-jointed, third and fourth longest. The margin of the body bears some small spines, and the epidermis covered with tubular spinnerets.

Newstead's description hardly agrees with Maskell's; for he says, "Ovisac composed of closely felted white wax." I have never seen this species.

706. *Luzulaspis luzulæ*. Cat. Coccidæ, p. 143.

Genus XVIII. *Ceroplastes*, Gray.

Spicilegia Zoologica, p. 7, pl. iii, figs. 6-7. 1830.
Signoret, *Ann. Soc. Ent. France* (5), vol. ii., p. 35. 1872.
Maskell, *Trans. N. Zealand Inst.*, vol. xxv., p. 214. 1892.
Green, *Coccidæ of Ceylon*, Part iv., p. 268. 1909.

The coccids included in this genus are popularly known as "wax scales" from the large amount of waxy, or, rather, greasy white secretion encrusting the adult females. This material is exuded by the female larvæ as soon as they attach themselves to the bark or foliage, and it accumulates with the growth of the coccid until at the adult stage it consists of a mass several times larger than the coccid beneath. The male puparia are very rare, but in the one species where they have been identified they have the glassy box-shaped characters of the male *Lecanium*.

The adult female, removed from the enfolding secretion, is more or less hemispherical in form, allied to the Lecanid type, but often much softer; in most cases furnished with six-jointed antennæ, of which the third is the longest, and with well developed legs; the derm, or skin, without any special characteristic markings.

The female is very prolific, large numbers of rounded eggs accumulating beneath the coccid, and as she withers up the wax hardens and the minute larvæ crawl out and quickly infest the foliage.

This genus seems to be sub-tropical; of the sixty species described, most of them come from Mexico and South America; others from Africa and India; one species is described from Australia, but it is very probable that its native home is Ceylon.

Ceroplastes ceriferus, Anderson. (Plate X., Fig. 4.)

Coccus ceriferus, Monog. Cocci ceriferi. 1791.
Ceroplastes chilensis, Gray, *Spicilegia Zoologica*, p. 7. 1830.
" *australiæ*, Walker, *Cat. Brit. Mus. Homoptera*, vol. iv., p. 1087. 1852.
" *ceriferus*. Sign., *Ann. Soc. Ent. France* (5), vol. ii., p. 40. 1872.
" " Mask., *Trans. N. Zealand Inst.*, vol. xxv., p. 216. 1892.
" " Green, *Coccidæ of Ceylon*, Part iv., p. 270. 1909.

The species is very common in Australia, where it is generally known as the "White Wax" or "Indian Wax Scale." Introduced at a very early date with ornamental shrubs from India or Ceylon, it has spread all over the

garden plants, and from them into the waste lands and orchards. In the waste lands it has a great preference for the "native blackthorn" (*Busaria spinifera*), but it is also found on many other plants and trees. In the orchard it chiefly infests citrus trees, but it is particularly fond of the persimmon, sometimes infesting every twig and branchlet if neglected. Adult female reddish brown (in the earlier stages varying from pink to rich red); outer surface soft; dorsal surface convex; outer margins irregular; under surface flattened or slightly concave; legs and antennæ well developed; anal segment produced into a distinct elongate tail. Length variable, up to ⅜ inch.

Puparium under normal conditions composed of a mass of pure white secretion, forming a thick coating of a greasy, waxy, watery mass, rounded and convex on the summit, but irregularly depressed round the sides, like a small loaf of bread. This completely encrusts the coccid, so that the outward appearance of the white wax scale is that of the puparium. Diameter, up to nearly ½ inch.

The presence of this coccid often produces quantities of black smut or fumagine, which cover the infested twigs, branches, and foliage, and even the coccids themselves.

744. *Ceroplastes ceriferus.* Cat. Coccidæ, p. 149.

735. *Ceroplastes australiæ.* Cat. Coccidæ, p. 148.

Ceroplastes floridensis, Comstock.

Report United States Department of Agriculture, 1880, p. 331. 1881.

This is a cosmopolitan species, originally described from the United States, but found all over India, Japan, West Indies, and the Hawaiian Islands. It is recorded upon many fruit trees and shrubs, and in Mrs. Fernald's catalogue is reported from Australia, but if so it is a rare and comparatively unknown coccid in this country.

758. *Ceroplastes floridensis.* Cat. Coccidæ, p. 152.

Ceroplastes rubens, Maskell. (Plate XI.)

Trans. N. Zealand Inst., vol. xxv., p. 214, pl. xii., figs. 6–10. 1892.
Ceroplastes myricae, Green, *Indian Museum Notes*, vol. v., No. 18. p. 8. 1900.
Ceroplastes rubens, Green, *Coccidæ of Ceylon*, Part iv., p. 273. 1909.

Though originally described from Australia, it is probable that this coccid, which is commonly known as the "Red Wax Scale," was introduced into this country from Ceylon, and from there spread to Japan and the Hawaiian Islands. It is comparatively rare on any of our native shrubs, but common in gardens, especially in our Botanic Gardens, where it attacks many eastern shrubs, such as tea, mango, various palms, ficus, ivy, &c.; on large-leaved trees the coccids have the curious habit of following up the ribs of the leaf, so that when badly infested the whole upper surface of the leaf often has a regular pattern outlined upon it; at other times they thickly encrust the small twigs, and blacken the foliage of the whole tree. *C. rubens* has been recorded upon plum, pear, and orange trees, but it is not a common scale in orchards in Australia.

Adult female reddish brown; dorsal surface convex; under surface concave; a little longer than broad; anal segment elongate, forming a pig-like extremity; anal cleft small; legs small, six-jointed antennæ, with the third joint longest. Length, $\frac{1}{10}$ inch.

Puparium formed of pale pink, hard, semi-opaque crystalline wax, in which the adult female is closely encased, which gives the outer covering a much deeper reddish tint. General form irregularly rounded, with the dorsal centre convex, but the outer edges irregularly rounded and impressed; marked with bands of opaque white wax. Length, $\frac{1}{8}$ to $\frac{1}{6}$ inch.

782. *Ceroplastes rubens.* Cat. Coccidæ, p. 156.

(*To be continued.*)

A New World's Champion Butter Producer.

A Guernsey cow is responsible for another record performance in the way of butter production. It is significant that the previous record had also been held by one of that breed—namely, May Rilma (22761).

The present world's champion, Murne Cowan, is a ten-year-old cow, having been born in May, 1905. She dropped her last calf on 1st February, 1914, and then commenced her testing period, with the result that she has given 24,008 lb. of milk, producing equal to 1,098 lb. of butter fat (approximately 1,307 lb. commercial butter). Her performance, month by month, is as follows:—

	Milk.	Test.	Butter Fat.
1914.	lb.	per cent.	lb.
February...	611·00	4·59	28·04 (9 days)
March	2,281·30	4·31	98·32
April	2,361·50	4·32	102·02
May	2,305·90	4 03	92·93
June	2,210·80	4·10	90 64
July	2,089·70	4·38	91·53
August	1,934·50	4·44	85·89
September	1,841·50	4·66	85·81
October	1,733·20	4·80	83 19
November	1,834·60	4·99	91·55
December	1,884·40	5·10	96·10
1915.			
January	1,871·30	5·28	98 80
February...	1,048·30	5·09	53·36 (19 days)
Total	24,008·00	4·574 Average.	1,098·18

The figures will help to show what an extraordinary producer this cow is, as, for the last nineteen days of the test, she gave over 53 lb. of butter fat. Murne Cowan is in calf, having been bred to on the 1st August, 1914, so that she was over six months in calf when the test was completed. As a six-year-old this cow had already shown a record of 845 lb. of butter fat, and her daughter, Sweet Maria, has shown as a three-year-old 682 lb. of butter fat. This cow is related to the one-time noted cow, Dolly Dimple, who as a three-year-old gave 906 lb. of butter fat.

The champion is rather a plain-headed cow, but has a wonderful constitution and an excellent bag. The dairy wedge shape is of course evident, and her thighs are very thin and flat. She was bred by Mr. A. F. Peairs, of Elizabeth, Pa., U.S.A., and is owned by Mr. O. C. Barber, of Akron, Ohio.—M. A. O'Callaghan.

Egg-laying Tests at the Hawkesbury Agricultural College.

THIRTEENTH YEAR'S RESULTS.

A. A. DUNNICLIFF, JUNIOR.

THE thirteenth series of the egg-laying competitions conducted at the Hawkesbury Agricultural College closed on Wednesday, the 31st March. In several respects notable results were achieved, and the year's data rank among the most valuable yet secured. This was especially so in regard to the comparative tests of various forms of housing—and even non-housing—carried out, and the results, both productive and financial, throw a good deal of light upon controversial points upon which commercial poultry-keepers required authoritative guidance; and, while one year's experiments cannot be accepted as conclusive, there is little doubt that they can be regarded as sufficiently reliable for general purposes. The day for conducting laying competitions merely as a struggle for supremacy between breeders, and as an advertisement for their strains, has gone, and these educative experiments, in which the breeders supply the birds, represent the real value of the work carried out in this connection at Hawkesbury College, and gives it world-wide pre-eminence.

The conspicuous feature is the world's record individual score established by one of Mr. S. Champion's White Leghorns in the single-pen section. Her total of 288 just exceeds, by two eggs, the previous best under competitive conditions, which stood to the credit of a White Leghorn in the 1913–14 Missouri (U.S.A.) competition.* The lowest score of his six hens was 212, while their total of 1,541 stands as the highest yet put up at Hawkesbury. It might have been better had not two of the pullets been too young to commence laying until the competition had been in progress six weeks.

Another notable performance is that of Mr. L. L. Ramsay's Black Orpingtons, whose total of 1,417, or an average of 236 each, is easily the best record for the breed in the whole series. This is especially pleasing in view of the fact that Mr. Ramsay is the only breeder who has been represented in these competitions without a break since the start, and he has remained loyal to the one breed right through.

The second-year hens gave 9 per cent. better laying results than the best in the previous seven tests, and their average of 158 eggs must be classed as an excellent one. The total of 1,156 by Mr. J. Lowe's White Leghorns is also the highest recorded in the series.

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* Since this was written, the report of the English Utility Poultry Club's 1913-14 Competition has been received, showing that the best individual record in that test was 288 eggs by a White Leghorn hen.

Turning to the comparative tests, it is to be noted that in the test of judgment in selection eight out of ten breeders selected pens of "good" layers that gave better money results than their "bad" pen, and the sixty good hens gave an average net profit of 2s. 2d. each more than those chosen as bad layers. Mrs. L. B. Gresson's picked pen produced 316 eggs more than her culls, and returned £2 3s. 5d. more in egg value. The hens that were penned without houses yielded results that are worthy of study, exceeding, as they do, the expectations of all but the advocates of the "open-air" system. The test of the shedding system with pens of six hens was altogether in favour of the ordinary open-yard methods, both in laying and financial returns, and in the relative appearance of the birds right through. The hens in the intensive shed were fed on dry mash, while those in the open yards received the ordinary wet mash. In the housing experiment with two lots of 100 White Leghorns supplied by Mr. S. Ellis, those confined in the intensive house produced 14,003 eggs, as against 16,849 by those under semi-intensive conditions.

The cost of feeding was not as high as many might have expected, owing to the comparatively low rates ruling for the first six months. It was not until the closing three months that the pinch of high prices was felt, and the College, of course, has never been at the disadvantage of having to pay a premium on market quotations, as very many poultry-farmers have had to do for months past. The average price of eggs is little below that of the previous competition, owing largely to good laying in the first few months, when rates were higher than in the preceding year. The whole of the hens in competition returned an average profit of 10s. 2d. over the cost of feed, as compared with 10s. 1d. in the previous year. This was on an average laying of 174 eggs per hen.

The executive management was in the hands of a committee consisting of Messrs. H. W. Potts (Principal, Hawkesbury Agricultural College), J. Hadlington (Government Poultry Expert), A. L. Wyndham (Poultry Instructor, Hawkesbury Agricultural College), S. Ellis, C. Leach, L. L. Ramsay, J. Stewart, and F. J. Brierley (competitors' representatives), and A. A. Dunnicliff, jun. (organising secretary).

THE PRIZE WINNERS.

The prize money, which amounted to £116, including a donation of £50 by the *Daily Telegraph*, and £3 by Mr. D. Kenway (for no-house test) was won as follows :—

Two Years' Competition.

Greatest number of eggs in the second twelve months.—J. Lowe, 1,156 eggs (1), £3; E. W. Hyndman, 1,151 (2), £2; Glen Farm, 1,131 (3), £1 10s.; J. D. Nicholson, 1,094 (4), £1; A. Duffield, 1,092 (5), 10s.

Greatest number of eggs in the two years.—J. D. Nicholson (1), £2 10s.; E. W. Hyndman (2), £1 10s.; G. White (3), £1.

Winter test (April to July inclusive).—G. Judd, 255 eggs (1), £2; J. Lowe, 254 (2), £1; G. Speed, 245 (3), 10s.

Market value of eggs for two years.—J. D. Nicholson (1), £2; D. Salter (2), £1 10s.; Glen Farm (3), £1.

Monthly prizes of 10s. for the highest total from a pen.—April, W. H. Forsyth, 74 eggs; May, Cowan Bros. and G. Judd, 50; June, J. Lowe, 84; July, J. D. Nicholson, 101; August, J. D. Nicholson, 130; September, G. White and Glen Farm, 138; October, A. Duffield, 148; November, A. Duffield, 146; December, A. Duffield, 147; January, T. Partridge, 123; February, E. W. Hyndman, 114; March, J. D. Nicholson, 102.

Champion prize of £5, or trophy of the value of £5, for most eggs in two years, without the replacement of a bird.—J. D. Nicholson.

Thirteenth Annual Competition.

Greatest number of eggs in the twelve months.—S. Champion (1), £5; L. L. Ramsay (2), £4; W. Newall (3), £3; Fairfield Farm (4), £2; Mrs. L. B. Gresson (5), £1 10s.; H. Hammill (6), £1; F. J. Brierley (7), £1; Mrs. J. H. Jobling (8), £1; L. K. Pettit (9), £1; B. Clarke (10), £1.

Winter test (first four months).—S. Champion, 455 eggs (1), £3; L. L. Ramsay, 420 (2). £2 10s.; Mrs. L. B. Gresson, 415 (3), £2; C. Simmons, 383 (4), £1; A. W. Waine, 368 (5), 10s.

Market value of eggs for the twelve months.—S. Champion (1), £3 10s.; L. L Ramsay (2), £2 10s.; Mrs. L. B. Gresson (3), £1 10s.; W. Newall (4), £1.

General utility prizes (open to pens, the hens in which average at least 6lb. in weight on 1st March, 1915), decided by the number of eggs laid.—L. L. Ramsay, weight of hens 38¾lb. (1), £3; Mrs. J. H. Jobling, 36lb. (2), £2; Standard Yards, 36½lb. (3), £1 10s.; J. Madrers, 37½ lb. (4), 10s.

Monthly prize of 10s. for the highest total from a pen.—April, E. J. Kenney, 83 eggs; May, S. Champion, 120; June, C. Simmons, 134; July, L. L. Ramsay, 159; August, L. L. Ramsay, 162; September, W. Newall, 161; October, Mrs. J. H. Jobling, 154; November, S. Champion, 152; December, W. M. Norrie, 145; January, Mrs. S. A. Hudson, 130; February, Mrs. S. A. Hudson, 127; March, S. Champion, 129.

Test of Judgment in Selection.

Greatest difference in the number of eggs laid by the two pens in the twelve months (subject to the "bad" pen laying the smaller total).—Mrs. L. B. Gresson (1), £2 10s.; Mrs. G. Reed (2), £1 10s.; Miss C. C. Mackney (3), £1.

Single Pen Test.

Light Breeds.—Greatest number of eggs laid by a hen in the twelve months: S. Champion (1), £2; S. Champion (2), £1 10s.; S. Champion (3), £1; S. Champion (4), 10s.

Heavy Breeds.—Greatest number of eggs laid by a hen in the twelve months: Standard Yards (1), £2; C. Simmons (2), £1 10s.; C. Simmons (3), £1; R. Jobling and A. W. Waine (4), 5s. each.

Shedding Test.

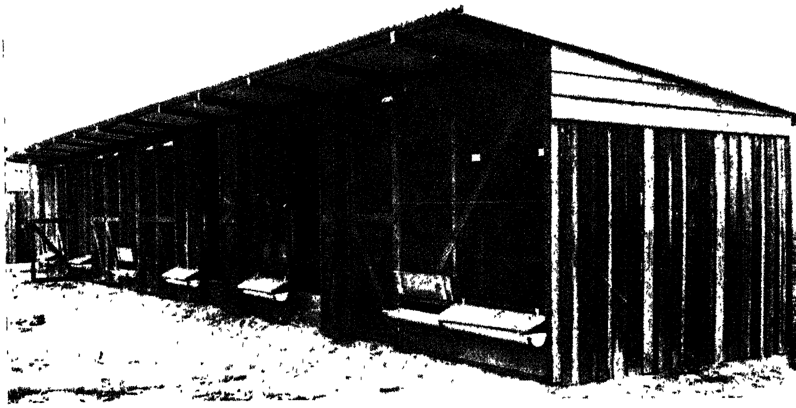
Greatest number of eggs laid in the twelve months.—E. T. Rhodes (1), £3; St. Joseph's Farm (2), £2; F. J. Brierley (3), £1.

Monthly prize of 10s. for the highest total from a pen.—April, St. Joseph's Farm, 42 eggs; May, E. T. Rhodes, 102; June, A. D. Knox, 103; July, E. T. Rhodes, 103; August, A. D. Knox, 138; September, E. T. Rhodes and F. J. B. Crowder, 125; October, St. Joseph's Farm, 136; November, St. Joseph's Farm, 131; December, St. Joseph's Farm and F. J. Brierley, 112; January, F. J. Brierley, 120; February, E. T. Rhodes, 98; March, St. Joseph's Farm, 97.

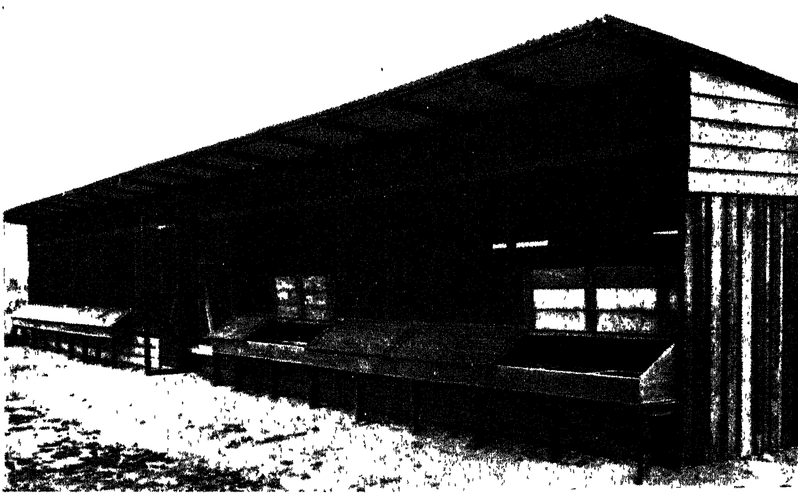
No-house Test.

Winter test (first four months).—P. C. McDonnell, 415 eggs (1), £1; D. Kenway, 349 (2), 10s.

Greatest number of eggs in the twelve months.—L. K. Pettit (1), £2 10s.; D. Kenway (2), £1 10s.; P. C. McDonnell (3), 10s.



Intensive House subdivided into sections for 6 hens for comparison with the results of the Thirteenth Annual Competition run in the usual way.



Poultry House divided into intensive and semi-intensive sections, each 30 ft. by 17 ft., to accommodate 100 birds.

EGG-LAYING TESTS AT THE HAWKESBURY AGRICULTURAL COLLEGE.

Mr. J. D. Nicholson's White Leghorns.

Winners of the Two Years' Test.

Mr. E W. Hyndman's White Leghorns.

Second in the Two Years' Test.

Mrs. L. K. Pettit's White Leghorns.

Winners of the No-house Test

EGG-LAYING TESTS AT THE HAWKESBURY AGRICULTURAL COLLEGE.

POULTRY EXPERT'S COMMENTS.

In a brief review Mr. Hadlington remarks:—"The thirteenth series of the laying competitions stands out as the most successful, insomuch as it has produced records and data not hitherto obtained. Three new sections were added—the intensive, semi-intensive, and no-house. These were the outcome of a wave of enthusiasm over the so-called intensive system, which experienced somewhat of a boom for some months prior to the commencement of the competition. The intensive method failed, both in the large flock of 100 hens and also in the small flocks of six hens, to come up to or justify the expectations of its advocates, as will be seen on reference to the tabulated figures. But it must be said the no-house test justified its inclusion, and slightly higher averages were put up than for the annual competition as a whole. But notwithstanding this, breeders will do well not to rush to conclusions, for it should be remembered that only six pens were competing, and in a year when fair conditions prevailed; also that they were penned in ideal pens for the test.

Housing Systems.

"The results from the semi-intensive house of 100 hens are of more than ordinary interest to breeders. This test has shown the very fair average of 168 eggs per hen run in a flock of 100, as against the average of the competition of 181, when it is taken into consideration that these 100 hens, although of a good strain, were not selected hens in the same sense as would be the six in a pen, and the fact that the latter had the run of yards 87 x 17 feet. At any rate, it is a demonstration of what is possible with flocks of 100 hens, with only ordinary flock selection of culling out the prospective bad layers.

"The continuation of the single pen tests has been more than justified by results. It will be remembered that some doubts were entertained last year upon the merits of the single pen as a means of securing individual records, owing to the poor tallies made. It was doubted whether hens would put up their best performances when isolated; but I expressed the opinion that other causes had been in operation to produce indifferent results. This was remedied, and the results have proved highly satisfactory. The fact that the record hen, and also the record pen, have emanated from this section, is conclusive evidence that hens are under no disability in single pens.

Standard Weights.

"The total results of the competition have disclosed nothing to support the contention that was made against the minimum weight standards it was sought to impose last year, but which were somewhat relaxed owing to the short notice given to breeders. On the contrary, even from a productive point of view, they are supported by the results. Weights of all pens were taken, and the results can now be compared to some extent. It is found that the four first pens were all up to and mostly over stipulated weights, and only three pens out of about a dozen under-weight ones that were

subsequently accepted made any conspicuous tally. Many of them are very low down the list. It is significant, too, that the highest tally of the light-weights finished up 200 eggs below the highest record, and that the second highest tally was made by one of the heaviest pens. It is not contended that production follows weight in all cases; but what is demonstrated is that there is nothing incompatible between fair weight and high production."

Mortality and Disease.

The general health of the hens was excellent, with a continued absence of infectious disease. The death-rate was much below the average, totalling only 28 out of 762 competition birds. Ten out of 438 first-year hens died, 3 out of 168 second-year, 5 (two killed by foxes) out of 60 single pen, 8 out of 60 in the shedding test, and 2 (one killed by fox) out of 36 in the no-house pens.

Intensive v. Semi-intensive Systems.

The housing experiment to test the intensive and semi-intensive systems under flock conditions was distinctly in favour of the method of confining hens or allowing them an outside run, at the discretion of the poultryman, as compared with keeping the hens continuously confined in houses. This experiment was made possible by Mr. S. Ellis readily agreeing to a suggestion that he should provide 100 White Leghorn pullets of similar age and breeding for each section.

The houses were each 30 by 17 feet, the perches being in the back half, while the front half was littered for scratching. The hens in the semi-intensive section had the run of a well-grassed yard of 22,000 square feet. Both lots were fed on a dry mash formula of 60 lb. pollard, 20 lb. bran, 12 lb. lucerne dust, 8 lb. meat meal (40 per cent. protein), and 1½ lb. salt. The grain ration varied according to the season, from a low proportion of maize to one to three of wheat. Chaffed green feed in the form of lucerne and rape was given at midday.

The total cost of feeding the 200 hens was £72 5s. 2d., or 7s. 2¾d. each. It would doubtless have been interesting if separate accounts of the feeding of the two lots had been kept, although observation indicated that there was no appreciable difference. The eggs, which were sold in Sussex-street, Sydney, realised gross £166 10s. 5d., which, after deducting £16 0s. 3d. for freight, cartage, and commission, gave a net return of £150 10s. 2d., or 1s. 2·05d. per dozen. Only one dozen eggs were broken in transit. The 100 hens in the intensive section gave a profit of 6s. 5¼d. each over the cost of feed, while those in the semi-intensive section averaged 9s. 1¾d. each. Considering that feed prices for the year averaged a good deal above the normal, a net return of over 9s. from 100 average pullets of a good strain when run in one lot must be considered very satisfactory. This in the true commercial aspect, however, is discounted by the fact that the death-rate was abnormally high, being 12 hens in the intensive shed and 10 in the semi-intensive. These were replaced, but if the 22 hens be valued at 10s. each there would be a reduction of £11 on the profits, equal to 1s 1¼d. per hen.

Mr. L. L. Ramsay's Black Orpingtons.

Leading pen in Heavy Breeds, and second in the Thirteenth Annual Competition; 1,417 eggs in twelve months.

Mrs. L. B. Gresson's pen of "Good" layers in Test of Judgment.

Laying a total of 1,344 eggs while the "Bad" layers laid 1,028 eggs.

First and Third hens (owned by Mr. S. Champion) in Single Pen Test

The left-hand bird put up a world's record of 288 eggs, while that on the right laid 267 eggs.
The holder of second place proved a somewhat refactory subject for the camera.

EGG-LAYING TESTS AT THE HAWKESBURY AGRICULTURAL COLLEGE.

The following table shows the monthly laying and the net average results in each section of 100 birds:—

—	Intensive.	Semi-intensive.
April	422	511
May	750	921
June	782	1,242
July	956	1,395
August	1,712	1,893
September	1,680	1,974
October	1,912	2,032
November	1,632	1,821
December	1,298	1,526
January	768	1,345
February	1,123	1,153
March	968	1,036
Total	14,003	16,849
Average per hen	140·0	168·5
Value per hen	13s. 8d.	16s. 4½d.
Cost of food per hen	7s. 2¾d.	7s. 2¾d.
Profit per hen	6s. 5¼d.	9s. 1¾d.

THE FINANCIAL ASPECT.

The 762 hens of various ages and under the different forms of management (but not including the intensive and semi-intensive test under flock conditions), showed a net profit over the cost of feed of 10s. 2d. each. The total net value of the eggs, after deducting freight and selling charges, was £641 11s. 1d., and the cost of feed £254 10s. 3d., leaving a surplus of £387 0s. 10d. The following are the details:—

SECOND-YEAR HENS.

Cost of feeding: Wheat, £23 0s. 7d.; maize, £4 16s. 2d.: pollard, £9 2s. 7d; bran, £4 10s. 10d.; meat meal, £1 3s. 10d.; green food, £2 13s. 11d.; salt, 2s. 9d.; shell grit, 12s. 8d.; total, £46 3s. 4d., or 5s. 6d. per head.

Market value of eggs laid, £123 1s. 6d., leaving a profit of £76 18s. 2d., or 9s. 2d. per head.

FIRST-YEAR HENS.

Cost of feeding (including 10 pens of "bad" layers): Wheat, £72 11s. 1d.; maize, £17 0s. 5d.; pollard, £28 16s. 11d.; bran, £13 12s. 3d.; meat meal, £3 15s. 11d.; green food, £9 13s. 1d.; salt, 8s. 1d.; shell-grit, £3 0s. 11d.; total, £148 18s. 8d., or 6s. 9½d. per head.

Market value of eggs laid, £379 2s. 2d., leaving a surplus of £230 3s. 6d., or 10s. 6¼d. per head.

SINGLE PEN TEST.

Cost of feed: Wheat, £9; maize, £1 18s. 5d.; pollard, £4 10s. 7d.; bran, £2 4s.; meat meal, 10s. 1d.; green food, £2 5s. 11d.; salt, 1s. 3d.; shell-grit, 15s.; total, £21 5s. 3d., or 7s. 1d. per head.

Market value of eggs laid, £56 5s. 11d., leaving a surplus of £35 0s. 8d., or 11s. 8d. per head.

SHEDDING TEST (Pens of 6 hens each.)

Cost of feed: Wheat, £10 1s. 4d.; maize, £2 13s. 7d.; pollard, £3 3s. 10d.; bran, £1 0s. 10d.; meat meal, 16s. 1d.; green food, £4 2s. 4d.; lucerne dust, 15s.; salt, 1s. 5d.; shell-grit, 8s. 11d.; total, £23 3s. 4d., or 7s. 8½d. per head.

Market value of eggs laid, £48 19s. 3d., leaving a surplus of £25 15s. 11d., or 6s. 7d. per head.

NO-HOUSE TEST.

Cost of feed: Wheat, £6 11s. 9d.; maize, £1 8s. 3d.; pollard, £3 7s. 1d.; bran, £1 14s. 3d.; meat meal, 6s 9d.; green food, £1 6s. 3d.; salt, 8d.; shell-grit, 5s. 8d.; total, £15 0s. 8d., or 8s. 4d. per head.

Market value of eggs laid, £34 2s. 3d., leaving a surplus of £19 1s. 7d., or 10s. 8d. per head.

THE MONTHLY LAYING.

The following is the total laying in the various sections each month :—

	Second-year Hens.	First-year Hens.*	"Good" Layers.	"Bad" Layers.	Single Pens.	Shedding Test.	No-house Test.
No. of hens	168	378	60	60	60	60	36
April	741	1,497	342	87	239	362	280
May	639	4,126	755	411	498	742	540
June	1,004	4,516	766	658	667	948	474
July	1,798	6,299	943	931	873	1,086	615
August	3,058	7,617	1,088	1,070	945	1,316	670
September	3,388	7,846	1,091	1,228	1,156	1,302	748
October...	3,426	7,901	1,172	1,183	1,201	1,189	709
November	3,280	7,082	1,011	1,080	1,052	1,094	676
December	2,926	6,616	950	986	920	933	611
January	2,492	5,948	880	822	897	816	551
February	2,140	4,940	655	686	806	741	433
March	1,684	4,314	536	382	748	654	371
Totals	26,576	68,702	10,189	9,524	11,254	9,908	6,687

* Including 60 "good" layers.

COMPARISON OF RESULTS.

The following tables analyse and compare the results of the whole series:—

SECOND-YEAR HENS.

	No. of Pens.	Highest total, two years.	Highest total, second year	Average per hen, first year.	Average per hen, 2nd year.	Profit over feed per hen, first year.	Profit over feed per hen, second year.	Greatest value of eggs per pen, two years.
						£ s. d.	£ s. d.	£ s. d.
1st ..	40	2,487	1,054	180	124	0 11 2	0 6 0½	12 1 6
2nd ...	50	2,634	1,150	179	127	0 10 11	0 5 4¾	12 16 9
3rd ...	40	2,319	1,013	190	140	0 11 4	0 9 8	13 2 5
4th ...	40	2,369	1,045	194	134	0 16 9	0 5 8	12 14 2
5th ...	30	2,372	1,110	184	140	0 10 2	0 8 3	12 2 2
6th ...	30	2,373	1,028	201	135	0 14 4	0 6 11	12 11 7
7th ...	30	2,552	1,091	194	145	0 14 0	0 7 6	13 12 3
8th ..	28	2,421	1,156	190	158	0 13 7	0 9 2	12 1 8

	Eggs per Hen.		Value per Hen.	
	First Year.	Second Year.	First Year.	Second Year.
6 Langshans	189·6	142·6	20/6	15/-
132 White Leghorns	192·8	163·4	19/6	15/-
6 Silver Wyandottes	177·8	156·1	18/4	14/9
6 Brown Leghorns	175·6	163·3	16/7	14/3
18 Black Orpingtons	177·2	123·4	18/7	11/8

ANNUAL COMPETITION.

	No. of Pens.	Winning Total.	Lowest Total.	Highest Monthly Total.	Average per Hen.	Greatest Value.	Average Net Price of Eggs.	Average Value per Hen.	Cost of Feed per Hen.	Profit over Feed.
1st ...	38	1,113	459	137	130	140/-	1/1	15/6	6/-	9/6
2nd ...	70	1,308	666	160	163	150/-	1/3¾	17/9	5/9¾	12/-
3rd ..	100	1,224	532	154	152	114/-	1/-	12/9	4/5½	8/3
4th ...	100	1,411	635	168	166	125/-	-/11½	13/3	5/3½	8/-
5th ...	100	1,481	721	162	171	137/-	1/0½	14/10	5/10	9/-
6th ...	60	1,474	665	161	173	149/-	1/2¼	17/2	7/-	10/2
7th ...	50	1,379	656	159	180	146/-	1/3¼	19/2	7/9½	11/4
8th ...	60	1,394	739	158	181	173/-	1/5¼	21/9	6/9	15/-
9th ...	40	1,321	658	151	168	134/5	1/2	16/3½	6/5½	10/2
10th ...	50	1,389	687	146	184	141/9	1/2½	18/5½	6/1½	12/4
11th ...	50	1,461	603	156	178	164/7	1/3½	19/4¼	7/3½	12/0¾
12th ...	50	1,360	724	152	177	145/3	1/2½	17/7	5/9	11/10
13th ...	63	1,541	705	162	181	152/9	1/2	17/8½	6/9½	10/11

	Eggs per Hen.	Value per Hen
12 Brown Leghorns	199·3	18/10
6 Buff Orpingtons	174·8	18/7
216 White Leghorns	190·8	18/5
66 Black Orpingtons	178·3	17/9
36 Silver Wyandottes	166·7	16/3
36 Langshans	150·7	14/11
6 Jubilee Orpingtons... ...	139·8	14/6

TEST OF JUDGMENT IN SELECTION.

	"Good" Layers.		"Bad" Layers.		Points.
	Eggs.	Value.	Eggs.	Value.	
		£ s. d.		£ s. d.	
Mrs. L. B. Gresson	1,344	6 15 6	1,028	4 12 1	316
Mrs. G. Reed	1,161	5 19 5	971	4 8 3	190
Miss C. C. Mackney	961	4 18 8	776	3 12 9	185
E. F. Thomson	1,244	6 8 9	1,123	5 3 9	121
Mrs. W. J. Gregory	883	4 8 2	806	4 0 2	77
F. Clayton	1,095	5 8 1	1,053	4 17 9	42
H. Ekin	891	4 6 7	902	4 1 4	— 11
J. Knoetzsch	901	4 10 0	922	4 8 0	— 21
A. F. Camkin	705	3 11 5	788	3 13 7	— 83
Mrs. H. V. Hopkins	1,004	4 11 5	1,155	5 10 2	—151
Total	10,189	50 18 0	9,524	44 7 10	—
Average per hen	169·8	16/11½	158·7	14/9½	—

SHEDDING (INTENSIVE) TEST (in pens of 6 hens each.).

	Open Yards.		Intensive Shed.	
	Eggs.	Value.	Eggs.	Value.
		£ s. d.		£ s. d.
E. T. Rhodes, White Leghorns ...	1,262	6 2 8	1,185	6 1 7
St. Joseph's Farm, White Leghorns...	1,075	5 8 3	1,150	5 17 2
D. Kenway, Black Orpingtons ...	1,264	6 11 4	1,121	5 15 7
F. J. Brierley, White Leghorns ...	1,295	6 6 4	1,093	5 2 9
F. J. B. Crowder, White Leghorns ...	1,169	5 8 6	971	4 9 1
J. R. Stewart, White Leghorns ...	1,042	5 13 1	925	4 6 5
C. Leach, Black Orpingtons	1,231	6 6 0	909	4 18 1
Hillcrest Farm, White Leghorns ...	1,209	6 5 3	908	4 12 6
A. D. Knox, Black Orpingtons ...	1,069	4 16 2	892	4 5 9
J. H. Hemsworth, Silver Wyandottes	812	3 13 9	754	3 10 4
Total	11,428	56 11 6	9,908	48 19 3
Average per hen	190·4	18/10	165·1	16/4
Cost of feed	—	6/9½	—	7/8½
Profit per hen	—	12/0½	—	8/7½

NO-HOUSE TEST.

	Ordinary Houses.		No Houses.	
	Eggs.	Value.	Eggs.	Value.
		£ s. d.		£ s. d.
L. K. Pettit, White Leghorns ...	1,272	6 7 4	1,219	6 2 7
D. Kenway, Black Orpingtons ...	1,264	6 11 6	1,176	6 1 8
P. C. M'Donnell, Black Orpingtons...	1,102	5 13 9	1,172	6 5 5
J. Gillies, White Leghorns	1,163	5 16 6	1,089	5 8 1
C. Banks, White Leghorns	1,175	5 11 3	1,058	5 8 9
J. Madrers, Black Orpingtons ...	942	4 6 9	973	4 15 9
Total	6,918	34 7 1	6,687	34 2 3
Average per hen	192·1	19/1	185·7	19/-
Cost of feed	—	6/9½	—	8/4
Profit per hen	—	12/3½	—	10/8

THE DETAILED RETURNS.

The following tables give full details of the number of eggs laid by each pen of six birds (or each bird in the single pen test), together with the market value and the average weight of the eggs. The figures in parentheses after each competitor's name indicate the deaths during the whole period of the section. In the thirteenth annual competition the pens with an asterisk (*) preceding the owners' name were selected as bad layers, and (s) indicates the groups of hens tested in single pens.

Second-year Hens.

Owner and Breed.	First Year.	April.	May.	June.	July.	August.	Sept.	October.	Nov.	Dec.	January.	Feb.	March.	Second Year.	Total.	Weight per doz.	Value Second Year	Total Value.
																oz		
1. J. D. Nicholson (0), Arncliffe : White Leghorns ..	1327	5	40	67	101	130	135	141	119	84	86	84	102	1094	2421	25	103/6	241/8
2. E. W. Hyndman (0), Miranda : White Leghorns ..	1218	18	0	30	97	120	136	147	143	140	117	114	89	1151	2369	24	103/8	223/-
3. G. White (0), Willoughby : White Leghorns	1265	21	6	12	64	119	138	141	130	124	119	106	99	1079	2344	26½	97/2	227/5
4. D. Salter (0), Wilberforce : White Leghorns	1360	32	28	21	68	110	121	129	113	117	75	69	81	964	2324	26	89/1	234/4
5. Glen Farm (1), Jilliby Jilliby : White Leghorns ..	1183	8	40	56	97	128	138	140	139	133	96	77	79	1131	2314	24	104/1	233/6
6. J. Lowe (0), Baulkham Hills : White Leghorns ..	1129	32	43	84	95	129	131	131	125	113	112	91	70	1156	2285	25	111/9	227/4
7. T. Partridge (2), Westmead : White Leghorns ..	1290	17	22	20	41	97	132	139	139	122	123	82	33	967	2257	26	84/-	214/6
8. A. Duffield (0), Carlingford : White Leghorns ..	1120	16	19	21	57	116	130	148	146	147	105	98	89	1092	2212	25½	100/4	210/6
9. Johns Bros. (0), Wyong : White Leghorns	1135	1	18	55	81	108	131	142	138	129	109	96	66	1074	2209	24½	97/6	210/8
10. Cowan Bros. (0), Burwood : White Leghorns.. ..	1109	64	50	31	35	98	130	130	130	120	104	88	91	1077	2186	24½	104/7	216/9
11. G. Speed (0), Mt. Druitt : White Leghorns	1177	55	41	56	93	110	106	109	110	88	96	71	51	986	2163	25½	97/1	211/9
12. King and Watson (0), St Mary's : White Leghorns ..	1101	56	27	14	83	118	111	123	123	113	90	82	69	1009	2110	28	105/2	213/2
13. S. Ellis (2), Botany : White Leghorns	1169	30	19	38	66	115	118	103	117	90	91	87	45	919	2038	26	84/9	208/-
14. A. W. R. Simpson (1), Belmore : White Leghorns	1129	24	7	39	79	105	108	108	110	108	98	87	65	933	2067	25	89/-	201/-
15. W. J. Wexted (0), Rozelle : White Leghorns	1167	26	20	35	57	90	107	106	103	108	100	84	66	902	2069	26	84/6	202/9
16. M. A. White (1), Wilberforce : White Leghorns ..	1151	10	5	15	62	101	134	140	116	114	77	84	51	909	2060	24	77/9	194/6
17. P. Paulsen (1), Boolaroo : Brown Leghorns	1054	11	6	36	40	104	126	137	134	124	116	97	49	980	2034	25	85/8	185/3
18. W. H. Forsyth (1), Willoughby : Silver Wyandottes	1067	74	27	5	53	114	120	133	102	87	95	72	55	937	2004	27	88/5	198/5
19. G. Judd (1), Boolaroo : Langshans	1138	47	50	71	87	123	113	91	84	56	47	60	27	856	1994	24½	90/-	213/3
20. E. T. Griffiths (1), Waratah : White Leghorns ..	1089	17	7	76	39	104	111	113	115	105	71	86	59	903	1992	25	83/6	196 9
21. J. Silcock (0), Rhondda : White Leghorns	1127	14	12	7	20	87	134	135	134	119	88	66	29	845	1972	26	70/9	178/6
22. M. A. Vennard (1), Eastwood : White Leghorns ..	1135	23	11	18	93	116	1 9	98	102	71	78	49	48	836	1971	27	74/8	196/2
23. J. Ireland (0), Helensburgh : R. C. Wh. Leghorns ..	1041	34	17	44	63	108	119	120	137	92	88	50	33	905	1946	24	81/6	181/9
24. T. Pritchard (2), Ingleburn : Black Orpingtons ..	1096	39	45	28	26	109	96	100	81	70	70	71	76	811	1907	24	79/3	192/6
25. R. E. Howcroft (0), Miranda : White Leghorns ..	985	0	8	45	33	99	127	118	128	114	95	59	38	864	1849	25	73/8	169/5
26. Lucknow Farm (1), Ryde : White Leghorns ..	1047	5	20	22	68	98	102	109	106	98	80	55	15	778	1825	24½	69 9	176 6
27. A. R. Kennedy (0), Carlingford : Black Orpingtons .	1098	56	24	18	5	96	89	92	81	78	42	54	71	706	1804	26	68/2	186/-
28. H. J. Hollier (0), Emu Plains : Black Orpingtons ..	996	5	26	40	95	106	116	97	75	62	24	21	38	705	1701	24½	63/2	166/3

THIRTEENTH ANNUAL COMPETITION.

Owner and Breed.	April.	May.	June.	July.	August.	Sept.	October.	Nov.	Dec.	January.	Feb.	March.	Total.	Weight per doz.	Market Value.
														oz.	
1. (s) S. Champion (0), Woonona: White Leghorns	73	120	124	138	148	147	148	152	136	109	117	120	1541	25½	152/9
2. L. L. Ramsay (0), Carlingford: Black Orpingtons	40	114	107	159	162	146	138	116	121	118	78	118	1417	24½	146/9
3. W. Newall (0), Marrickville: White Leghorns	3	60	111	123	156	161	144	129	142	123	119	111	1382	24	134/2
4. Fairfield Farm (1), Plumpton: Brown Leghorns	29	93	96	112	144	151	145	137	130	122	113	96	1368	24	132/-
5. Mrs. L. B. Gresson (0), Killara: White Leghorns	60	112	120	123	97	136	129	140	124	120	101	82	1344	24	135/6
* Mrs. L. B. Gresson (1), Killara: White Leghorns	6	27	63	119	117	130	138	132	117	103	47	29	1028	25	92/1
6. H. Hammill (0), Kogarah: White Leghorns	2	81	68	133	152	147	143	119	141	127	114	109	1336	24½	129/5
7. F. J. Brierly (0), Cheltenham: White Leghorns	17	65	95	124	138	136	143	135	130	113	109	90	1295	24	126/4
8. Mrs. J. H. Jobling (0), Plattsburg Black Orpingtons	7	77	117	120	139	154	154	117	104	104	90	99	1282	24½	126/4
9. L. K. Pettit (1), Eastwood: White Leghorns	40	103	81	111	131	137	129	137	134	107	92	70	1272	24¾	127/4
10. B. Clarke (1), Old Guildford: White Leghorns	34	56	82	112	134	130	135	129	131	116	111	96	1266	24	124/9
11. D. Kenway (0), W. Pennant Hills: Black Orpingtons	22	59	133	115	146	151	143	123	88	101	90	93	1264	24	131/6
12. E. T. Rhodes (0), Ryde: White Leghorns	28	90	53	106	124	135	141	142	144	126	99	74	1262	24½	122/8
13. E. F. Thomson (0), Austral: White Leghorns	55	103	71	110	116	121	128	115	117	113	97	93	1244	24½	128/9
* E. F. Thomson (0), Austral: White Leghorns	2	48	54	110	127	146	140	127	106	107	100	62	1123	24	103/9
14. Mrs. S. A. Hudson (0), Ryde: White Leghorns	—	33	73	116	96	124	149	146	141	130	127	106	1241	25	118/1
15. Mrs. W. D. Bradburne (0), Kogarah: White Leghorns	24	61	53	102	144	143	153	140	138	111	92	80	1241	24	116/9
16. C. Leach (0), Belmore: Black Orpingtons	33	81	120	120	105	130	132	111	108	113	100	78	1231	24	126/-
17. Gordon Bros. (0), Ermington: White Leghorns	17	38	44	112	139	137	136	159	123	119	113	99	1221	24½	114/9
18. E. F. Silcock (0), Armidale: Silver Wyandottes	—	49	86	123	148	139	133	121	107	114	107	88	1215	24	110/1
19. L. E. Magon (0), Enfield: White Leghorns	33	108	66	100	121	132	137	133	119	92	92	80	1213	26	121/-
20. Hillcrest Farm (0), Berowra: White Leghorns	41	95	108	122	121	123	119	107	102	104	85	82	1209	24½	125/3
21. (s) W. Gordon (0), Dundas: Brown Leghorns	52	31	109	97	126	133	130	133	104	116	82	87	1200	24	123/3
22. Mrs M. Chalmers (0), Kogarah: White Leghorns	8	73	52	116	128	129	141	147	123	116	90	75	1198	26½	112/4
23. (s) C. Simmons (2), Kiama: Langshans	20	99	134	130	144	150	129	113	97	62	57	60	1195	25½	117/5
24. W. M. Norrie (0), Ryde: White Leghorns	8	64	50	91	126	137	151	146	145	123	77	72	1190	24	110/3
25. (s) Rewa Farm (0), Baulkham Hills: White Leghorns	36	76	57	97	114	133	126	125	117	113	95	93	1182	25½	116 3
26. G. A. Steele (0), Kogarah: White Leghorns	8	55	65	83	122	143	144	142	134	122	86	78	1182	25	110/4
27. C. Banks (0), Bankstown; White Leghorns	12	85	54	80	134	139	140	132	131	114	86	68	1175	25	111/3
28. G. Barwick (0), Hinton; White Leghorns	28	82	54	81	123	145	144	139	113	100	98	72	1170	25	112/8
29. F. J. B. Crowder (0), Canley Vale: White Leghorns	—	54	72	88	138	141	145	132	131	117	77	74	1169	26	108/6
30. J. Gillies (0), Killara: White Leghorns	56	58	67	94	128	124	123	113	111	105	97	87	1168	24	116/6
31. Mrs. G. Reed (0), Sefton Park: White Leghorns	36	107	83	90	115	107	126	112	99	114	96	76	1161	25¾	119/5
* Mrs. G. Reed (0), Sefton Park: White Leghorns	7	52	41	53	101	128	130	118	109	97	100	35	971	24½	88/3
32. (s) C. C. Kennett (0), Glenfield: White Leghorns	46	103	77	105	126	132	132	123	96	69	70	71	1150	24	116/8
33. J. de Evans (0), Turramurra: White Leghorns	7	61	56	86	129	142	137	138	124	102	84	69	1135	26	105/5
34. R. H. Stewart (0), Leeton: White Leghorns	14	76	81	119	91	134	122	114	101	113	94	73	1132	24	112/4
35. O. Ingram (0), Canley Vale: White Leghorns	11	40	61	98	113	144	149	132	119	104	94	67	1128	24	104/7
36. (s) Standard Yards (0), Sefton Park: Langshans	14	73	102	122	146	138	129	115	80	66	86	51	1122	28	109/-
37. D. Chrystal (0), Bankstown: White Leghorns	22	52	62	108	125	133	119	111	109	103	83	84	1111	24½	107/6
38. P. C. M'Donnell (0), Beecroft: Black Orpingtons	28	97	103	102	130	108	111	94	90	98	64	77	1102	24	113/9

THIRTEENTH ANNUAL COMPETITION—*continued.*

Owner and Breed.	April.	May.	June.	July.	August.	Sept.	October.	Nov	Dec.	January.	Feb.	March.	Total.	Weight per doz.	Market Value.
														oz.	
39. F. Clayton (0), Blacktown : White Leghorns	45	95	78	72	103	132	137	124	111	98	71	29	1095	25½	108/1
* F. Clayton (0), Blacktown : White Leghorns	19	69	76	106	124	141	137	128	105	81	65	2	1053	25½	97/9
40. St Joseph's Farm (0), Ryde : White Leghorns	42	87	82	78	107	100	118	98	94	91	97	81	1075	24	106/3
41. A. D. Knox (0), West Wallsend : Black Orpingtons	—	1	59	148	145	133	147	111	88	94	75	68	1069	24	96/2
42. E J. Goddard (0), Mascot : Langshans..	40	115	105	105	128	116	116	83	80	45	55	75	1063	25¼	112/1
43. (s) R. Jobling (1), Wallsend : Silver Wyandottes	37	55	106	112	149	116	101	81	79	70	46	103	1055	24	109/4
44. F. Axam (0), Nowra : Buff Orpingtons	38	89	113	123	119	96	92	80	78	82	70	69	1049	24½	111/8
45. H. Lamey (0), Fairfield : White Leghorns	36	62	51	68	134	128	126	124	112	85	56	61	1043	24¼	93/1
46. R. W. Ray (0), Carlingford : Silver Wyandottes	31	50	94	137	124	120	111	91	76	78	84	46	1042	24	103 7
47. J. R. Stewart (1), Thirlmere : White Leghorns..	2	55	28	68	128	140	135	124	131	107	74	50	1042	25½	93/1
48. (s) A. W. Waine (1), Mt. Drummond : Black Orpingtons	48	74	94	132	137	135	89	78	53	77	57	46	1040	27½	105/3
49. A. S. M'Kimm (0), East Maitland : Langshans..	76	92	83	110	117	115	88	97	73	67	69	47	1034	24½	99/8
50. G. Hopping (0), Ingleburn : White Leghorns	33	100	59	86	117	123	126	113	112	68	74	21	1032	24	100/6
51. W. Alley (0), Speers' Point : Brown Leghorns	7	47	60	67	123	136	129	127	98	106	81	43	1024	24	93,8
52. Mrs. H. V. Hopkins (0), Westmead : White Leghorns	27	43	32	81	126	127	139	122	103	93	69	42	1004	24½	91/5
* Mrs. H. V. Hopkins (0), Westmead : White Leghorns	—	87	72	76	127	145	134	120	128	104	91	71	1155	25½	110/2
53. J. Bulluss (1), Glenfield : White Leghorns	20	47	64	73	126	126	133	118	116	82	53	49	1007	24½	93/4
54. P. M'Colgon (0), Mittagong : White Leghorns	2	51	28	45	128	141	142	129	117	82	62	71	998	25	88 5
55. E. J. Kinney (0), Beecroft : Silver Wyandottes	83	66	71	120	114	116	100	75	86	82	30	52	995	24	104/–
56. A. C. Collis (1), Lidcombe : Silver Wyandottes	23	83	69	68	100	89	119	111	106	90	71	65	994	24	100/2
57. A. Benson (0), Ingleburn : White Leghorns	12	71	65	87	100	129	132	121	109	57	61	39	983	24	93/–
58. Miss C. C. Mackney (0), North Parramatta : Black Orpingtons .. .	4	81	75	91	126	97	102	98	89	75	60	63	961	25½	94/8
* Miss C. C. Mackney (0), North Parramatta : Black Orpingtons .. .	—	21	59	72	89	114	101	80	99	54	64	43	776	24¼	72/9
59. D. J. Stephens (0), Rouse Hill : Silver Wyandottes	17	22	53	124	127	112	115	94	83	70	51	76	944	24¼	89/
60. J. Madrers (0), Kogarah : Black Orpingtons	—	22	52	157	119	145	99	81	77	75	70	45	942	26	86/9
61. (s) Mrs. E. Scaysbrook (1), East Gosford : Black Orpingtons .. .	—	43	97	115	131	118	96	77	73	54	62	64	924	24½	90/–
62. J. Knoetzsch (0), Upper Bankstown : Langshans	51	55	69	95	119	119	97	81	69	69	43	34	901	26	90/–
* J. Knoetzsch (0), Upper Bankstown : Langshans	13	39	78	107	113	107	106	102	87	77	45	48	922	25½	88/–
63. H. Ekin (0), Kogarah : Langshans	8	26	87	113	111	87	109	78	83	73	54	62	891	24½	86/7
* H. Ekin (0), Kogarah ; Langshans	—	—	62	103	107	113	117	101	102	86	58	53	902	25½	81/4
64. Mrs. W. J. Gregory (0), Parramatta : Black Orpingtons	10	95	94	67	90	117	102	86	83	83	22	34	883	24½	88/2
* Mrs. W. J. Gregory (0) Parramatta : Black Orpingtons	20	39	88	111	62	101	91	76	82	49	67	20	806	26½	80/2
65. H. W. Dyer (1), Belmore : Black Orpingtons	37	46	69	117	108	112	96	59	61	56	44	56	861	24	87/9
66. (s) A. H. Padman (0), Adelaide : White Leghorns	25	36	48	38	95	100	109	103	98	80	69	44	845	24	80/5
67. G. E. O. Craft (1), Ingleburn : Jubilee Orpingtons	26	74	74	88	93	91	90	76	57	51	57	62	839	24	86/9
68. F. C. Nicholls (0), Wilberforce : Langshans	6	17	40	88	112	101	110	80	66	63	75	74	832	24	77/5
69. J. H. Hemsworth (0), Parramatta : Silver Wyandottes	—	8	62	86	131	110	116	76	65	58	59	41	812	25	73/9
70. C. Bloomfield (0), Willoughby : White Leghorns	43	56	34	49	80	81	81	94	87	81	62	29	777	24	76/9
71. Burrowes and Lovegrove (1), Rooty Hill : Black Orpingtons	6	46	52	95	104	96	93	78	67	51	32	38	758	24	71/7
72. T. G. Wilson (0), Walli : White Leghorns	3	4	13	13	58	104	115	119	88	90	66	55	728	24	69/4
73. A. F. Camkin (0), Kogarah : Langshans..	46	33	57	101	85	48	103	55	72	42	42	21	705	24½	71/5
* A. F. Camkin (0), Kogarah : Langshans..	20	29	65	74	103	109	89	96	71	64	49	19	788	25½	73/7

SHEDDING TEST.

—	April.	May.	June	July.	August.	Sept.	October.	Nov.	December.	January.	February.	March	Total.	Weight per doz.	Market value.
1. E. T. Rhodes (o), Ryde: White Leghorns	46	102	81	115	94	125	126	127	88	106	98	77	1,185	24	121/7
2. St. Joseph's Farm (1), Ryde: White Leghorns	53	72	80	84	86	115	136	131	112	99	85	97	1,150	24	117/2
3. D. Kenway (3), W. Pennant Hills: Black Orpingtons	35	84	101	95	65	121	125	117	96	98	94	100	1,121	22	115/7
4. F. J. Brierley (o), Cheltenham: White Leghorns	25	36	54	94	116	119	133	126	112	120	95	63	1,093	24	102/9
5. F. J. B. Crowder (o), Canley Vale: White Leghorns	24	27	40	62	98	125	125	127	108	100	92	43	971	25	89/1
6. J. R. Stewart (o), Thirlmere: White Leghorns	10	40	32	77	109	113	128	100	90	101	72	53	925	26	86/5
7. C. Leach (o), Belmore: White Leghorns	18	53	73	86	83	119	111	100	94	81	46	45	909	24	98/1
8. Hillcrest Farm (1), Berowra: White Leghorns	28	32	86	89	72	100	103	84	84	83	86	61	908	24	92/6
9. A. D. Knox (1), West Wallsend: Black Orpingtons	—	16	87	111	138	112	107	66	69	61	63	57	892	24	85/9
10. J. H. Hemsworth (2), Parramatta. Silver Wyandottes	—	36	33	60	84	107	107	74	67	58	70	58	754	24	70/4

NO-HOUSE TEST.

—	April.	May.	June.	July.	August.	Sept.	October.	Nov.	December.	January.	February.	March.	Total.	Weight per doz	Market value.
														oz.	
1. L. K. Pettit (o), Eastwood: White Leghorns	29	109	46	118	128	121	121	128	134	104	103	78	1,219	25	122/7
2. D. Kenway (o), W. Pennant Hills: Black Orpingtons	44	84	101	120	114	128	120	97	100	106	75	87	1,176	24	121/8
3. P. C. McDonnell (1): Black Orpingtons	91	117	98	109	127	135	120	94	78	78	67	58	1,172	24	125/5
4. J. Gillies (o), Killara: White Leghorns	39	122	75	76	103	121	139	135	105	82	75	17	1,089	28	108/1
5. C. Banks (o), Bankstown: White Leghorns	77	70	51	90	117	115	109	121	105	87	60	56	1,058	28	108/9
6. J. Madrers (1), Kogarah: Black Orpingtons	—	47	103	102	81	128	100	101	89	94	53	75	973	26	95/9

SINGLE PEN TEST.

—	April	May.	June.	July.	August.	September.	October.	November	December.	January.	February.	March.	Total.	Weight (oz.)
S. Champion ..	20	24	23	25	27	25	27	27	22	23	21	24	288	2
S. Champion ..	20	22	21	22	23	24	24	27	26	19	16	23	267	2¼
S. Champion ..	22	23	21	21	24	25	25	24	24	21	18	22	270	2
S- Champion ..	11	22	18	24	26	26	27	28	24	22	23	19	270	2
S. Champion .	—	13	19	23	24	24	23	24	23	21	20	20	234	2¼
S. Champion ..	—	16	22	23	24	23	22	22	17	3	19	21	212	2¼
W. Gordon	—	—	12	19	23	23	23	21	20	19	7	—	167	2
W. Gordon	16	4	19	11	23	25	24	25	21	20	17	15	220	2
W. Gordon	6	13	18	17	17	16	16	19	8	21	17	15	183	2¼
W. Gordon	14	7	19	9	20	21	22	22	21	18	20	19	212	2
W. Gordon	4	6	20	21	21	24	24	24	19	21	19	17	220	2
W. Gordon .. .	12	1	21	20	22	24	21	22	15	17	2	21	198	2
C. Simmons	—	24	29	25	28	24	28	25	18	16	11	24	252	2
C. Simmons	—	16	28	16	28	24	23	18	13	16	10	13	205	2
C. Simmons	—	15	16	24	20	21	19	19	14	*	*	*	148	2¼
C. Simmons ..	—	17	25	23	28	26	19	19	17	*	*	*	174	2¼
C. Simmons .. .	—	10	22	14	21	27	21	16	21	11	20	10	193	2
C. Simmons . ..	20	17	14	28	19	28	19	16	14	19	16	13	223	2¼
Rewa Farm	12	20	15	17	17	13	14	14	10	14	4	1	151	2¼
Rewa Farm .. .	11	7	—	5	22	26	24	21	21	19	18	19	193	2¼
Rewa Farm .. .	4	11	8	19	22	26	23	22	23	21	18	20	217	2¼
Rewa Farm ..	—	—	—	18	22	23	22	23	22	20	18	17	185	2
Rewa Farm .	3	21	16	18	14	23	21	23	20	20	18	22	219	2
Rewa Farm ..	6	17	18	20	17	22	22	22	21	19	19	14	217	2¼
C. C. Kennett ..	2	21	20	18	20	23	22	20	13	15	17	11	202	2¼
C. C. Kennett	8	23	9	16	21	22	24	24	11	—	8	7	173	2
C. C. Kennett .	4	13	3	20	22	23	23	25	20	17	19	15	204	2¼
C. C. Kennett ..	3	6	9	12	21	21	20	11	19	8	11	17	158	2¼
C. C. Kennett ..	7	16	17	19	20	19	20	21	17	16	15	12	199	2
C. C. Kennett .	22	24	19	20	22	24	23	22	16	13	—	9	214	2
Standard Yards ..	—	—	20	18	24	24	19	13	10	10	17	14	169	2¼
Standard Yards ..	—	18	23	24	22	26	23	22	15	11	12	12	208	2¼
Standard Yards ..	—	13	20	23	22	19	22	18	11	8	17	-	173	2¼
Standard Yards ..	—	—	—	17	25	17	22	15	14	15	10	3	139	2½
Standard Yards ..	13	23	24	26	28	27	26	24	15	17	18	12	253	2¼
Standard Yards ..	1	19	15	14	25	25	16	23	15	5	12	10	180	2¼
R. Jobling	19	9	23	21	25	17	*5	*	*	*	*	*	119	2
R. Jobling .. .	16	25	24	17	25	21	19	18	15	13	13	17	213	2
R. Jobling . .	—	1	15	21	22	23	18	10	13	13	—	18	154	2
R. Jobling .. .	—	—	3	23	26	27	29	25	22	17	7	27	206	2¼
R. Jobling	—	3	22	16	25	17	14	16	17	15	13	24	182	2
R. Jobling	12	17	19	14	26	11	16	12	12	12	13	17	181	2
A. W. Waine . .	14	24	4	21	20	20	17	—	–	16	19	5	160	2¼
A. W. Waine.. .	—	3	18	17	21	22	18	19	10	15	12	10	166	2¼
A. W. Waine.. .	6	19	17	18	21	22	*8	*	*	*	*	*	111	2¼
A. W. Waine..	—	16	24	24	26	26	14	25	14	12	5	18	204	2¼
A W. Waine . ..	7	25	7	25	20	20	15	14	15	13	15	10	186	2¼
A. W. Waine.. ..	21	7	24	27	28	25	17	20	14	21	6	3	213	2¼
Mrs. E. Scaysbrook..	—	14	20	19	23	21	17	14	14	9	12	6	169	2
Mrs. E. Scaysbrook.	—	7	16	13	21	23	18	12	15	9	11	20	165	2¼
Mrs. E. Scaysbrook..	—	7	20	25	24	17	19	16	12	14	13	11	178	2
Mrs. E. Scaysbrook..	—	8	19	24	20	22	17	14	17	8	12	17	178	2
Mrs. E. Scaysbrook .	—	—	—	10	21	10	*1	*	*	*	*	*	42	2
Mrs. E. Scaysbrook..	—	7	22	24	22	25	24	15	15	14	14	10	192	2
A. H. Padman ..	6	9	25	19	24	22	24	24	21	18	16	16	224	2¼
A. H. Padman ..	8	2	—	—	—	—	—	—	—	—	—	—	10	—
A. H. Padman ..	—	9	12	15	24	24	28	28	24	21	11	4	200	2
A. H. Padman ..	—	—	1	—	—	—	—	—	—	—	—	—	1	—
A. H. Padman ..	7	—	—	—	22	26	27	25	25	19	24	12	187	2
A. H. Padman ..	4	16	10	4	25	28	30	26	28	22	18	12	223	2

* Dead.

Poultry Notes.

JAMES HADLINGTON, Poultry Expert.

May.

Seasonable Expectations of Laying.

A DUE appreciation of the seasonable expectations of laying in connection with the different conditions of stock on the poultry farm, would do much to overcome the disappointment that is often felt by the inexperienced, and would solve many of the apparent difficulties in regard to pullets or hens not laying when it is considered they should be doing so.

The question arises, what are seasonable prospects over a given period? To get at this matter, on a business basis, we must resort to the law of averages; the highest or the lowest that is possible is of no use to us, except to act as an incentive toward raising the standard of laying during the months of low average. So far attention has not been focussed upon this point, and in consequence every year brings forth its disappointments. For instance, the average poultry-keeper retains an idea that his pullets will come on to lay at any time between the ages of, say, four and a half to six months. That is, of course, correct, but the question arises, do they all do so; and, if so, do they lay consistently? When we come to analyse the matter, and resort to averages as a basis of calculation, we find how far we are from a correct appreciation of the true incidence of laying, and at once recognise that this is by no means a period of consistent laying, nor is such a time reached until we approach the spring months.

What the Laying Competitions teach us.

The laying competition just concluded at the Hawkesbury Agricultural College brought out, as in previous tests, many points of educational value. Prominent among these, the one in connection with seasonable laying expectations, stands out conspicuously, and reveals facts which are quite contrary to the notions entertained by the bulk of poultry-keepers.

This aspect of poultry-keeping was commented upon in the March Notes, particularly in regard to moulting hens and conditions met with on a normally-stocked farm. It was there emphasised that under normal conditions, the egg yield would be found to rise to October and fall again to May. The competition results just published make this a subject of special interest at the present time; not that they stand alone, but only confirm what all previous tests have demonstrated.

It must be conceded that the pullets penned in these competitions represent birds of a higher average laying quality than can be counted upon as an average of the individual farm; seeing that they represent selected specimens which are mostly of reputed good strains, and have been hatched at

approximately the right time. This being the case, we can take competition figures as likely to represent rather higher than ordinary flock averages. This then should form a basis upon which to compute the average expectations of layers in the different months. In matters of business, of whatever nature, it is essential that correct expectations be entertained, and chance factors be treated as only of minor importance.

The law of averages represents the only solid basis upon which to work, but poultry-keepers, particularly beginners, who have perhaps secured phenomenal results from small lots, are somewhat prone to take these experiences as a basis for commercial calculation. But the figures here produced of the averages from month to month in the last competition, in both first and second year sections, and which are also borne out by those taken from the "Ten Years Laying Competitions,"* compiled by Mr. A. A. Dunnicliff, jun., will form a basis of averages which should not be ignored.

FIRST-YEAR HENS (including "Good" and "Bad" Layers and Single Pens.)

Month.		Eggs.	Average per hen.
April,	1914	1,926	3·9
May,	"	5,247	10·5
June,	"	6,222	12·5
July,	"	8,318	16·7
August,	"	10,013	20·1
September,	"	10,376	20·8
October,	"	10,272	20·6
November,	"	9,262	18·6
December,	"	8,655	17·4
January,	1915	7,589	15·2
February,	"	6,379	12·8
March,	"	5,325	10·7

No. of hens.	Total.	Average per hen per annum.
498	89,584	179·9

SECOND-YEAR HENS.

Month.		Eggs.	Average per hen.
April,	1914	740	4·4
May,	"	638	3·8
June,	"	1,006	6·0
July,	"	1,798	10·7
August,	"	3,058	18·3
September,	"	3,378	20·1
October,	"	3,526	21·0
November,	"	3,280	19·5
December,	"	2,926	17·4
January,	1915	2,502	14·9
February,	"	2,140	12·7
March,	"	1,682	10·0

No. of hens.	Total.	Average per hen per annum.
168	26,674	158·8

* See Bulletin, No. 66, pages 41 and 42.

A close study of these figures will do much to dispel anticipations that are not likely to be realised, and will clear the ground for a proper appreciation of what may reasonably be expected.

It is, of course, understood that quite a number of eggs are laid by pullets prior to the 1st of April; but what stands out most conspicuously is, that pullets, taken on the average, cannot be regarded as a paying proposition until, say, about June, which means that instead of poultry-keepers looking forward to their pullets as being profitable from the age of five or six months onwards, if these figures have any significance, it means that the expectations of profit-making must be deferred to some time later, and brings us to the point previously emphasised in these notes, that taking averages as a guide, the months during which eggs are cheap have still to be looked forward to for remunerative returns.

In these notes, it should be understood that by the term "pullet" is meant a female under the age of twelve months; after this age she is classed as a hen.

It is worthy of note, too, that notwithstanding a more extended knowledge of the subject, consequent upon the lessons brought out in connection with penning birds likely to make a good start at the commencement of competitions, no advance has been made in the average of eggs laid by pullets in the dear period, April to July, for the past eleven years.

Hens in Second-year Laying.

If we, then, return to the expectations of laying from hens in their second year, we are further reminded that, notwithstanding the usual belief of poultry-keepers that their hens will lay as soon as they are over the moult, the figures here tabulated, representing those pens that have put up the best records in the competition of the previous year, conclusively prove that no considerable egg production may be anticipated before August, as they reached 18·3 per hen for that month. This, then, would appear to be a permanent feature under present conditions and methods.

These figures, representative as they are, will probably come as a surprise to many who have not studied the subject in the light of competition averages, such as are here set out. The idea of consistent winter laying must be regarded as largely a myth, and it is only by the realisation of the truth of this that we can prevent disappointment. One result may be to cause us to focus our attention upon improvement in that direction, if it be possible.

Agricultural Bureau of New South Wales.

NOTES COMPILED BY H. ROSS, Chief Inspector.

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Yurrunga and Avoca ...	Mr. W. H. Waters, Yurrunga.

Notice to Honorary Secretaries.

It is important that a record of the meetings of the branches should be inserted in the *Agricultural Gazette*, and honorary secretaries are invited to forward to the Department a short account of the proceedings of each meeting, with a brief summary of any paper which may have been read, and the discussion that followed it, as early as possible after each meeting. Notes for insertion in the *Agricultural Gazette* must reach the Department before the 16th to ensure insertion in the following month's issue.

Insect Pests.—Quite a number of the branches have availed themselves of the Department's offer to supply a set of insects, being the common pests of the district, and the collections are now being cased. The Government Entomologist suggests that as each district has certain pests peculiar to its orchards and gardens, more useful work would be done if the members themselves collected the local pests (orchard, garden, and stock) and sent them to the Department, where they would be arranged, mounted, a descriptive

label attached, and returned to the branch. Mr. Froggatt considers that such a collection would have a far greater value, as there would be more interest attached to the specimens when the members knew exactly where the pests came from, and where and how to find them.

Organisation of Branches.

An officer (Mr. A. M. Makinson) has been appointed especially to attend to the needs of branches of the Agricultural Bureau, and generally to organise this movement.

He will visit in turn every branch throughout the State, and confer with the Secretaries and members as to future operations, &c.

Secretaries will be advised in due course when this officer will pay a visit to their respective districts.

Demonstrations in Clearing Land and Subsoiling with Explosives.

A limited number of demonstrations in clearing land and subsoiling with explosives will be given by Mr. C. W. Burrows, Assistant Inspector of Agriculture, to branches of the Agricultural Bureau. Branches who wish to take advantage of this offer are requested to make early application to the Department through their honorary secretaries.

Bee-keeping.

A series of lectures on bee-keeping is being arranged by Mr. R. G. Warry, Instructor in Apiculture. Secretaries, whose branches intend availing themselves of this opportunity to receive a practical insight into this branch of agriculture, are requested to make early application.

REPORTS AND NOTICES FROM BRANCHES.

Blacktown.

The fourth monthly meeting of this branch was held on 6th April, the weather being exceptionally wet.

Four new members were elected. It was resolved that members absent from three consecutive meetings be fined 1s. 6d. each.

Members agreed to collect data as requested by the Department of Agriculture relative to local weeds.

Bloom Hill.

A meeting of abovenamed branch was held on 27th March, when there was an attendance of thirty-two, and eight new members were enrolled.

Owing to the indisposition of the Chairman, Mr. F. Tatlow was voted to the chair.

It was decided to discuss the subject of local weeds at next meeting and to forward a list to the Department, together with any supplementary information available.

Interesting and educative papers on "Fruit-growing," "Local Wheats," and "Strangles in Horses" were contributed by Messrs. William Downey, J. H. Spicer, and F. Tatlow respectively.

The following are summaries of the papers, and of the discussion that followed each one:—

FRUIT-GROWING.

Mr. W. Downey, in his paper on this subject, said that whether for home consumption or for sale fruit-growing must be carried out with a definite object in view—the production of the best class. Inferior fruit did not pay the cost of marketing. In the production of the best, the four chief factors were good cultivation, manuring, pruning, and spraying. The ground should be well worked and kept open; weeds and grass robbed the trees of moisture when it was most needed to mature the fruit.

Spraying had a twofold object, viz., the prevention of fungus diseases and the destruction of insect pests. In the treatment of pests and diseases care should be taken to identify the cause of the trouble. As a rule "insecticides" were of no use in preventing fungus diseases and *vice versa*, but no doubt a dressing of lime-sulphur or Bordeaux mixture was of great benefit to the trees. In order that spraying should be effective the orchardist should understand the preparation of proved remedies and the proper time for their application. Prevention of fungus disease was possible by spraying in time, but, once established, their cure was hardly practicable. A fungicide was a preventive. Its application should begin long before the disease had advanced far enough to manifest itself to any extent.

The fungi which caused most diseases of plants were low forms of vegetable life, which lived upon and within the tissues of higher plants. During the early spring days these parasitic fungi sent out small spores which corresponded to the seeds of higher plants. With favourable conditions as to moisture and warmth the spores lodged on other plants or other portions of the original plant and sent out their small branches. By the application of a fungicide to a plant the spores were destroyed, which had found lodgment on it, and the development of additional spores which would cause the disease to spread was prevented. As long as the tissues of plants were covered with a thin, even coating of fungicide very few fungi could develop upon them. Thus, if a fungicide was applied at regular intervals of about two weeks during early spring and summer most of the plant diseases would be held in check.

With regard to insect pests, there was a great difference in the way that insects took their food—some ate the leaves, pollen, or fruit, whilst others sucked the plant juices. To apply the remedy it was, of course, necessary to know to which class the particular insect belonged. Two of the best-known of the leaf or fruit eaters were the caterpillars of the vine moth and codlin moth. These insects were destroyed by a poisonous insecticide which killed by being taken into the stomach with the food. This class of poison was applied directly to the plants, no effort being made to apply it to the insect. Mr. Downey had had very good results from lime-sulphur, and—for codlin moth—arsenate of lead. The two combined generally kept trees free from leaf-eating pests. Other insects common on plants during spring and summer are green or black aphis. To destroy these he had used tobacco wash with very good results.

Another necessary factor in the production of good marketable fruit was judicious pruning, but it was a subject that could not be adequately treated within the limits of the paper.

DISCUSSION.—Replying to questions, Mr. Downey stated that spraying with nicotine was very effective in the control of peach aphis. Leaf curl was caused by a fungus. The best remedy was winter spraying with lime-sulphur, in the proportion of about 1 to 8 or stronger.

Half a dozen specimens of peaches were exhibited, which had been grown from seedlings; surer methods of propagation were budding and grafting. Grafting was usually done on to plum stock, as peach wood was very brittle. Care should be taken to prevent suckers. Give good watering and mulch. Grafting should be done in that district from middle to end of August.

LOCAL WHEAT CULTURE.

Mr. J. H. Spicer stated that during the past twenty years he had tried various wheats, amongst them being Steinwedel, Allora Spring, Manitoba, Purple Straw, Cleveland, White Lammas, Federation, and Chant's Prolific.

His experience had been that Chant's Prolific came first as the best all-round wheat. Federation was best for grain alone. Last year Chant's Prolific was sown during April on unfallowed land, ploughed with Fish double-furrow, and sown with the drill; 48 lb. of seed per acre, without fertiliser. There was a rainfall of 15 inches during the growing period. The crop yielded 34 bushels per acre for a test plot of 20 acres. Federation was grown under similar conditions with a yield of 35 bushels per acre. Both wheats were grown on heavy, red, clayey soil. This was the best yield for twenty years. In comparison with Federation he considered Chant's Prolific had a great advantage in a dry season, as it made a good hay for chaffing. It stood drought quite as well as, if not better than, Federation. In the driest year within his recollection, when there was a rainfall of only 12 inches, he harvested 8 bushels of Chant's Prolific per acre. It was a good milling wheat, and not liable to rust in a wet time or to frost in a cold snap. Federation, on the other hand, was liable to be rusted in a damp season and to be frosted, and it was also poor for hay purposes. Cleveland had also given very good results in good seasons. However, on samples of Cleveland and Chant's Prolific, grown under the same conditions, and forwarded to a Sydney mill, Cleveland was quoted at 2d. per bushel less than the other.

DISCUSSION.—In reply to questions, Mr. Spicer said Bobs yielded most flour per bushel. It was a very good wheat and did well in a sheltered locality, but it was liable to shell in an exposed position. Chant's Prolific would give better results than Cleveland on his ground. In other parts of the district Cleveland gave very good results. He did not change his seed, thinking it better to grade.

DEPARTMENTAL NOTE.—The experience at Bathurst Experiment Farm for a number of years has been that as an all-round wheat Cleveland is the best. It frequently happens that a particular locality may suit such a wheat as Chant's Prolific better than perhaps Cleveland or some other recommended variety. The Department has omitted Chant's Prolific from its lists because experience has proved Federation to be better as a grain yielder, and other varieties (according to the district) better as dual-purpose wheats under average conditions.

STRANGLES IN HORSES.

In his paper Mr. F. Tatlow said "Strangles" was almost identical with the common ailment known as "Distemper"; several veterinarians stated they were one and the same. It usually appeared in young horses (colts or fillies), especially in highly-bred animals. As it was a contagious disease all animals in the same paddock were likely to become infected unless they had previously suffered from it. Young animals contracted it more readily from aged than old from young. In stables where the complaint was discovered it was almost certain to attack all horses that were fed or bedded with the sufferer. Immediate isolation was recommended while the disease was in its early stages, and care should be taken to cleanse and fumigate all feeding troughs, boxes, and mangers where sick animals had been fed. Limewashing the walls, &c., of stables could not be too extensively carried out. The free use of tobacco wash could be recommended.

Thorough fumigation of stables and feeding places with tobacco smoke or sulphur was advisable, and it should be carried out while the horses were in the stables. When animals were discovered suffering in paddocks they should be at once housed and treated in the above manner. The disease could be contracted by actual contact, and even at considerable distance the germs exhaled are in many instances responsible.

The symptoms noticeable in early stages were slight indisposition or listlessness, then in a few days a stiff neck, somewhat swollen throat, a dry hacking cough, and a thin watery fluid succeeded by a thick purulent discharge of a whitish colour from the nose. The salivary glands, being inflamed, afterwards closed, pus then formed, and an abscess became pronounced. When suppuration took place in large quantities it was an indication that the abscess had broken and the animal was then on a favourable way to recovery. It was essential that means should be used to encourage free discharge from the nostrils. In some cases suppuration continued for weeks, and even in extreme cases, which had come under his notice, for months.

To effect a cure in the early stages of disease, an animal that has been broken in should be rugged, kept warm in a well-ventilated stable, fed on light bran mashes, &c., and given "hay-tea" as a drink. Undue falling off in condition should be prevented. If the patient had difficulty in swallowing food it was advisable to give it in a liquid form or as a drench. In the event of the throat becoming closed, some authorities advised the use of a small cricket bat or bat-shaped board, dipped in Stockholm tar; this was put down the throat as far as the abscess, or made to pass over the formation. When the lump would not discharge under ordinary circumstances a steaming process should be adopted by fixing on a nose-bag, containing a bran-mash sprinkled with turpentine or eucalyptus; his experience had proved the latter the better. The frequent application of fomentations was desirable. A simple and effective foment was made by mixing two teaspoonfuls of mustard in a pint of water. The region affected should be bathed with this frequently, say, morning, noon, and night. This treatment proved very effective in alleviating distress when a epidemic of strangles or distemper had broken out amongst 2,000 horses at a military encampment in connection with the 1901 celebrations.

Should the discharge from the nostrils resist the treatment, an operation with knife or lancet would probably be necessary, and for this purpose it was advisable to obtain the services of a practical veterinary surgeon, who would give full instructions for the further treatment of the case.

Discussion.—Replying to questions Mr. Tatlow stated that the disease was contracted from external sources, and more likely to manifest itself in damp weather, as the germs would then be more active. Fumigation would be more effective than spraying walls, &c., with germicidal preparations, as in the former the animal affected would inhale the fumes directly. The spraying would probably prevent the further spread of infection by destroying active germs. "Hay-tea" was prepared by immersing a bundle of hay in a can or bucket of water and allowing it to boil for an hour. When strained and cool enough it was given to the animal to drink or applied as a drench. In the application of Stockholm tar to the throat the gag would be of advantage to enable a clearer view of the affected part; if not available, a twitch could be used to raise the horse's head.

Borambil.

At the March meeting a discussion took place amongst members on the merits and demerits of stump-jump ploughs.

The branch had a credit balance of £1 17s. 6d. Two new members have joined.

Coradgery.

The first meeting of the year was held at the residence of Mr. W. E. Tayler, Adavale, on 13th March.

Interesting and valuable reports of 1914 season and harvest were submitted by Messrs. H. N. Marriott and W. E. Tayler.

Harvest Reports.

Mr. Tayler's paper was as follows:—Owing to the very poor rainfall during the growing period (the eleven weeks from 2nd July to 12th September, with only 26 points in five falls), results from fallow and manure were somewhat conflicting, and it was hard to account for some crops being better than others, when apparently the conditions under which they were grown were identical, but as there can be no effect without cause, the cause can generally be found, if looked for closely enough. Results of two fallow paddocks may be of interest to members. No. 1, 100 acres; No. 2, 200 acres. Both paddocks were ploughed in winter, 1913, and between then and sowing were worked twice with cultivators, and once with one-way disc. Between the second and last cultivation (which was immediately before sowing) a big crop of melons grew

on No. 2. No. 1 was comparatively free from them. No. 1 was sown from 1st to 11th April, as follows:—

Area.	Quantity of Seed.	Variety.	Fertiliser.	Yield per acre.
acres.	lb.			bus.
22	42	Yandilla King*	56 lb. superphosphate	18·82
29½	45	,, †	none	14·69
45½	45	,, †	40 lb. superphosphate	15·00

* Seed obtained from the Government. † Seed grown on the farm.

The average over the whole paddock was 15 62 bushels per acre.

There was a very uneven germination, patches in early July being a foot high, while some plants were only just out of the ground; a good percentage of seed rotted, and never came out at all. Sheep were turned in about the 7th July and the crop was eaten bare to the ground, and harrowed immediately afterwards.

No. 2 paddock was sown from 13th to 29th April, as follows:—

Area.	Quantity of Seed.	Variety.	Fertiliser.	Yield per acre.
acres.	lb.			bus.
80	45	Warren*	40 lb. superphosphate	6·75
16	45	Yandilla King*	40 lb. ,,	12·19
49	45	Federation	40 lb. ,,	5 88
42	54	,,	none	5·44
42	45	,,	40 lb. superphosphate	5·79
31	45	,,	none	5·87

* Seed obtained from the Government.

The average over the whole paddock was 6 35 bushels per acre.

The question is, why should there be such a marked difference in the yield of the two paddocks? While it is a notable fact that last harvest Federation was disappointing as compared with later maturing wheats, I attribute the failure of No. 2 paddock principally to the growth of melons taking too much of the conserved moisture out of the ground, and at the same time I have no doubt the feeding off helped No. 1 paddock considerably. As regards manure, the results of No. 1 paddock show in favour of super, but in No. 2 there is practically no difference. Again I look to the melons for an answer, as they evidently drained the ground to such an extent that it became only equal to ordinary stubble as regards moisture, and there was not enough left to make the manure of any benefit. As to rain records, the most the very earliest sown and latest ripening wheats had was 504 points, but most of the crops would only benefit by about 4 inches.

Mr. Marriott's paper was as follows:—Paddock No. 1, an old cultivation field, which had grown a considerable amount of feed, and on one portion was very "oaty," was ploughed with mould-board plough in March. When about half finished a good rain fell, about 125 points, making something of a shoot in the shape of black oats, trefoil, and various weeds. This half of the paddock was gone over with a weighted spring-tooth cultivator, and the whole was harrowed. It was sown by the middle of April with an ordinary broadcaster, and harrowed once; seed at the rate of three-quarters bushel per acre; no manure; varieties, Yandilla King and Federation. It received nice showers, and germinated fairly well, though some patches up to 5 acres in extent never showed at all. These were generally on the richest patches of the paddock (old sheep camps). About 30 acres in one corner was very "oaty," lighter soil. Good rains fell in May and June, bringing on the wheat well, and it promised by the end of July to be a nice crop. July, August, and September were unusually dry months. Harvested in November; patches burnt off; yield about 3 bushels per acre. The probable cause of failure was lack of moisture and too great growth of feed before ploughing.

Paddock No. 2 was also an old cultivation area, having grown a large quantity of feed, but it was fairly well kept down. Ploughed in April, harrowed and sown with the drill; no manure; three-quarters bushel to the acre; varieties, Federation and Yandilla King; sown in May. The seed germinated well and evenly all over, promised well until October, when patches burnt off on the portion first sown. The later-sown yielded best, though the sample was not so good as the earlier sown. There was no difference in yield between Federation and Yandilla King. The whole was very short in the straw. Federation much easier to strip and clean. Yield, 4½ bushels. The probable cause of the poor crop was want of rain.

Paddock No. 4.—This was suitable land; ploughed in May with mould-board then ploughed in March, mould-board ploughs being used. Sown about middle of April, broadcast and harrowed; some portion cultivated before sowing. This paddock showed no burnt patches, and better growth than 1 and 2. One bushel per acre was sown of Yandilla King and Federation. Harvested in November. The yield was three-quarters ton of hay per acre off 50 acres, 16 bushels per acre off about 100 acres. Caterpillars ate bare 80 acres of later sown stuff which promised well, and the ground remained bare right through after the caterpillars. The probable cause of the better crop was the natural condition of the soil, which suited the season.

Paddock No. 4.—This was stubble land; ploughed in May with mould-board and sown broadcast the end of the same month at the rate of 1 bushel per acre of Yandilla King and Federation. Portions were eaten by the caterpillars, but very little was burnt off; germination not too good; yield, 6 bushels. This paddock was sown during too wet a time to allow for a good seed bed, and poor germination resulted. Caterpillars and want of moisture also contributed to the failure. Amount of rain from April to November, 728 points; July, August, September, and October, only 120 points.

On the initiative of the Chairman a discussion followed on the value of pickling seed in various circumstances, the feature of the discussion being a contribution by Mr. W. R. Birks, Inspector of Agriculture. The discussion was of special interest owing to the abnormally dry conditions, a number of members holding that the seed wheat would not require pickling. Mr. Birks, however, clearly showed this was an erroneous idea, and he strongly recommended treatment with lime solution to follow that with bluestone.

Mr. Birks' report on the seed wheat competition for 1914 was read, and it was agreed to divide the first and second prizes between Messrs. A. Millgate and P. Lorimer. Trophies will be purchased and presented at the next meeting.

It was agreed to record a vote of thanks to Mr. Birks for judging the seed wheat competition and for the interest he had taken in the experiment plots, both seed and fodder; also to the stewards in the seed wheat competition, Messrs. Bevan and Frecklington, whose work in connection with measuring and weighing at a busy time had been considerable.

Seed Wheat Competition for 1915.

It was agreed that a seed wheat competition be carried out this year, and the following were agreed upon as the conditions:—

(1.) There shall be no restrictions as regards number of entries, except that no farmer shall make more than one entry for each variety. (2.) Area, from 3 to 7 acres. (3.) Seed sown may be graded or ungraded. (4.) No restriction as to variety. (5.) Hand-pulling of oats and strangers allowable. (6.) Area to be cut round with binder, or a space left of 3 feet. (7.) Crops to be inspected and judged at hay-cutting time, and marks awarded for cleanliness, purity of type, and for freedom from disease; crops to be judged for weight and quality after harvest; wheat to remain in bags on plot till such judging

is completed. (8.) Harvesting to be done by competitors in the presence of one or two neighbours where possible. (9.) Scale of marks:—Cleanliness and purity of type, 15; freedom from disease, 10; milling quality, 5; yield, one mark for every 20 lb., or half mark for every 10 lb. per acre, that is, three marks per bushel per acre; one mark for each half lb. over 60 lb. bushel weight. (10.) Entries to close 1st June, and to be received by the Secretary with entrance money; variety to be stipulated, and the plot as marked out to be shown on a plan. (11.) Entrance fee, 10s. for one entry, and 2s. 6d. each additional entry from same competitor. (12.) Prizes: First, trophy; second, trophy; third, certificate. (13.) Entries are restricted to members of the Coradgery branch of the Agricultural Bureau.

Coraki.

The following paragraphs are from a paper read by Mr. H. N. Campbell at the branch meeting on 16th March:—

Feeding of Pigs.

The method of feeding which I think is the best, is to erect pig-proof fences, enclosing about 4 or 5 acres each, plant with maize in the spring, and turn the pigs of all stages of growth. It will be found that not a grain will go to waste, but care must be taken to allow the pigs access to water. After they have finished the paddock, turn them into another, and plough the finished paddock and sow rape, field peas, vetches or mangel wurzels. Rape is one of the most valuable fodders for running pigs on; it is fit to feed off in about six weeks from sowing, and will last right through the winter if the land is well drained. Pigs of all ages thrive well on rape. Field peas and vetches are also crops on which pigs make rapid growth. All these are good for sows that are rearing litters. After the pigs are large enough to fatten, shut them up and top off with maize, milk, &c. I find that pigs fatten very quickly on maize after running on rape and other succulent crops. Moreover, this method cleans the land and puts it in good order for ploughing next spring. I have pulled very heavy crops of maize off land so treated, and attribute the result to the fertilising qualities of the manure. While on the subject of food, the importance of the mangel wurzel should be mentioned. Pigs are very fond of them, and thrive very quickly on them. The seeds are very shy to germinate, but they sometimes grow to a weight of 30 to 40 lb. each, and they are excellent keepers in the store and the ground. Lucerne is one of the best foods for pigs; in fact, it is almost indispensable on a well-regulated pig farm. It is an excellent diet at all stages of a pig's growth, and sows with litters mother them well when fed on lucerne. In fattening with maize greater progress is made when lucerne is added to their diet. Arrowroot and sugar-cane are also excellent food, but take too long to mature. It is desirable to find faster maturing crops, and I think we have them in imphi, rape, vetches, field peas, mangels, and lucerne.

The most prized breeds of pigs are the Berkshire and the Poland China, and they cross with satisfactory results with any other breed. The larger breeds of pigs, such as the Tamworth and British Black, make too rapid growth without putting on the required amount of fat, and consequently become too weighty for first-class baconers. But when crossed with a fat-producing pig like the Poland China, they cannot be surpassed. The Poland China is looked upon in America as a lard-producing pig, and I find that of all the breeds of pigs (and I have had to do with them all) this breed will fatten when others will only keep in good condition.

Forest Creek.

The monthly meeting was held on 13th March. Mr. J. W. Prosser was elected Chairman, vice Mr. F. W. Morgan, deceased. A short paper on poultry matters was read by Mr. W. Thompson, the idea being to encourage members to take up poultry as a side line on their farms.

Poultry Matters.

Mr. Thompson recommended obtaining birds of known laying strains of the dual-purpose breeds, as then there were the two lines of eggs and table poultry.

The writer found the White Leghorn-Wyandotte cross an excellent dual-purpose fowl here. They proved good layers, good sitters and mothers, and were of a nice plump body, suitable for table purposes. He recommended daily gathering of eggs, storing in a cool place. and forwarding to market two or three times per week. At the same time farmers should work on a co-operative basis in marketing their eggs. Attention should be paid to feeding and housing. In his experience corn was one of the best grains to feed for egg production. He strongly recommended members to read the poultry notes in the February issue of the *Agricultural Gazette.*

DISCUSSION.—Mr. T. B. PROSSER thought the distance from Sydney was too great for the profitable production of eggs and poultry. The eggs would be too long on the way in the hot weather.

Mr. J. G. CHUDLEIGH thought something might be done towards improving the breed of fowls already owned by farmers. They might as well feed good birds as bad ones.

Hay.

At a meeting held on 3rd March a branch was formed at Hay, and twenty-four members handed in their subscriptions of 1s. per annum. The following gentlemen were elected office-bearers:—Chairman, Mr. D. J. McRae; Vice-Chairman, Mr. W. Ashcroft; Hon. Secretary and Treasurer, Mr. F. Headon.

Mr. George T. Esplin promised to prepare a paper on sheep and wool for the next meeting.

Inverell.

At the annual meeting of this branch the Chairman's report showed that there had been nine meetings during the year, and useful papers had been read by members, and lectures and demonstrations given by officers of the Agricultural Department. The year finished with thirty-three financial members.

The Treasurer's statement showed the income for the year to have been £12 2s. 5d. and the expenditure £6 8s., leaving a credit balance of £5 14s. 5d.

The election of officers resulted as follows:—Chairman, Mr. J. Ditzell; Vice-Chairmen, Messrs. Maidens and Sweaney; Auditor, Mr. Sommerlad; Hon. Secretary, Mr. W. A. Kook.

The subscription fee was again fixed at 3s., the financial year to end on 31st December.

Leech's Gully.

The usual monthly meeting of the above branch was held on 29th March.

The request of the Department that the branch should determine the ten or twelve worst weeds in the district was read, and it was decided to deal with the matter at next general meeting.

Arrangements were made for the judging of the plots entered for the boys' crop competition.

Mr. J. O. Waugh presented to the branch a collection of noxious weeds, which should prove useful to members. Mr. Waugh was accorded the thanks of the members for his trouble in making the collection.

Miller's Forest.

The monthly meeting of this branch was held on 23rd March, the Chairman, Mr. J. Priddle, presiding.

The chief discussion of the evening was on the growth of paspalum in the district, and the menace it is to the lucerne-growers. It was pointed out that it was unsuitable for the district. It grew very coarse and reed-like, and cattle and horses would not eat it. Consequently it was allowed to seed and was spreading into the lucerne plots, where its eradication was impossible.

The Secretary was authorised to write to the Shire Council, asking what steps should be taken in order to declare it a noxious weed.

Penrose-Kareela.

The monthly meeting of the above branch was held at Kareela on 13th March. After due consideration it was decided to forego the proposed local fruit exhibition this season.

Several members reported having sent a combined consignment of apples to Sydney to be forwarded for the use of the British North Sea fleet.

It was agreed to make inquiries as to the opportunity of sending a further consignment of apples during the season.

Tallawang.

The monthly meeting of this branch was held on 27th March with a very good attendance of members. The correspondence from the Department *re* noxious weeds was brought under the notice of the members of the branch.

A pamphlet was read by Mr. T. Collins on the quality and usefulness of sisal hemp, and it was decided that the Secretary make inquiries as to the price of 500 plants.

Tangmangaroo.

On 11th September last a branch was established at Tangmangaroo with a membership of ten, which has since been increased to twenty-three. The subscription is 1s. per annum.

The following are the office-bearers:—Chairman, Mr. R. Wright; Vice-Chairmen, Messrs. T. W. Armour and F. W. Best; Hon. Secretary and Treasurer, Mr. A. Thompson.

The monthly meetings are held on the Saturday nearest full moon.

For the next meeting Mr. F. Boulding has promised to read a paper on the proper care of belts, and Mr. R. Wright will give a demonstration in belt-lacing.

Taralga.

The monthly meeting was held on 5th April, the Chairman, Mr. Quinn, presiding.

Reference was made to the exhibits of produce at Taralga Show in connection with the prize of £10 10s., which had been offered by members of the branch for the best collection of farm produce grown in the police district of Taralga. The first prize was won by Mr. W. Cooper, of Stone Quarry, and the second by Mr. A. McNielly, of Taralga. Both exhibits were of very high merit, and were the outstanding feature in the pavilion, practically every item in the extensive list, with the exception of ensilage, being shown. Irrigation played an important part in the production of the vegetables shown in both exhibits.

Subscribers to the prize were well pleased with the results achieved, and the Secretary reports that it is certain another effort will be made in the same direction next year.

Temora.

A meeting of this branch was held on 6th March, Mr. De Little being in the chair.

A paper was read by Mr. F. Dew, and from it the following is extracted:—

Pruning Fruit Trees.

Pruning has been called the art of checking the growth in one direction and encouraging it in another, and may be considered under two heads; first, that which aims at building up a good symmetrical tree; and second, that which is directed more towards increasing the production of fruit. Of course it would be manifestly impossible in a treatise such as this to outline a course of procedure which would be applicable to all cases, for we know that no two orchards will present exactly the same conditions. While one may have water available, and be able to show an annual growth of 4 feet, the adjoining one, labouring under drought conditions, may not be able to show 4 inches. It must be borne in mind, therefore, that anything herein advanced is intended to apply to normal seasons and normal growths. By a normal season is meant one in which there is a fall of not less than 18 inches of rain, and by normal growth, say 3 feet in young trees, and 18 inches in mature ones.

To obtain the best results we must start right at the beginning by reducing the head of the young tree in proportion to the loss of roots when removed from the nursery. If yearlings are planted, there will be a single straight stem, from which is stripped the lower buds. This, at the end of the first year's growth, should have developed four good strong shoots, about 3 feet long. These are cut back to about 12 inches, care being taken to cut to an outside bud. This rule is important in young trees, as it tends to produce a more symmetrical tree. Pruning to an inside bud tends to throw the young shoots inwards, but the aim should be a strong growth, with an upward and outward tendency.

At the end of the second year these four shoots, each developing from the two terminal buds, will have developed into, say, eight sub-shoots, and these in their turn are cut back at the winter pruning to about half their length, all laterals being removed at the same time. We then have eight clean one-year-old shoots free of laterals. These eight shoots at the end of the third year will have increased to say, sixteen, which again at the annual pruning are cut back to about half their length, always to an outside bud. If fruit is required, a few of the laterals may now be left.

The main object in this hard pruning of the young tree is to produce not fruit, but a vigorous, stocky tree, whose branches will not bend nor break by the heaviest crop of fruit.

Our tree is now in its fourth year, and ready to begin the important work of fruit production. We have outlined it with its four main limbs, its eight sub-limbs, and from these its sixteen branches, but these numbers are not arbitrary, merely approximate, and are given the better to explain our purpose and to emphasise the fact that once the head of the tree is definitely formed, the number of branches should not be materially added to. No matter how large a tree may ultimately grow to, the main growths should be confined to comparatively few main outlets. This is where amateurs nearly always fail. Thus the 16-branched tree often becomes under the amateur pruner one of thirty or more outlets in its fourth year, and so on, year after year. This continual adding to the top growth has the effect of diverting the greater flow of sap to the top of the tree, which is undesirable, and the result is to produce a too dense growth at the top, which throws the centre and lower limbs into shadow, and so further weakens the growth on their parts. Consequently, each year the growth of both wood and fruit is thrown more and more to the top of the tree. The object of pruning should be to counteract this tendency, and to this end the number of outlets at the top is reduced, and by keeping the tree open to the air and sunlight growth is encouraged upon the lower branches, where develop the laterals and fruit spurs which give the fruit. It is always

desirable to produce as much of the fruit as possible upon the lower branches, where it is more sheltered and less likely to damage by the wind. A properly pruned tree will give fruit right from base to summit.

Some varieties of trees, such as the cherry and fig, require little or no pruning beyond a little trimming at the start. These are the pruner's special delight, but there are others, such as the quince and cherry plum, which from the nature of their growth are the pruner's special antipathy. Apples, pears, and plums are reasonably easy to prune. Peaches and nectarines, on the other hand, entail a great deal of work, producing as they do a quantity of unnecessary wood. Fully two-thirds of their annual growth should be removed. The fruit of the peach comes upon the shoots of the previous year's growth, and the quantity to be produced is largely determined at the winter pruning. Most stone fruits tend to over-production, but it does not pay to allow the trees to overbear. It is better to produce 500 good fruit from a tree than 1,000 poor ones, for the reason that with 1,000 inferior fruit have to be produced 500 additional seeds, and it is these that sap the vigour of the tree. It is not so much the weight of fruit which matters; it is the number of seeds matured that counts, and that is the main factor in causing the exhaustion of the tree.

The apricot, again, lends itself to very vigorous pruning, and only by this means will the new wood be obtained on old trees which is so essential to fruit-bearing. The more vigorously apricots are pruned the more fruit-bearing wood will there be in the following year.

With all classes of trees it is essential to keep steadily to the practice of one outlet only to each branch, also the thinning out of the branches where necessary, in order to encourage new growth lower down. Of course, a reasonable number of laterals must be left, for more fruit is produced from a horizontal branch than an upright one—the one tending more to fruit spurs, the other to wood growth.

DISCUSSION.—The CHAIRMAN said he was interested in Mr. Dew's views as to the best method of forming the head of young trees, and particularly as to the period when the multiplication of branches should be carried no further.

Mr. FREEBORN asked if Mr. Dew favoured pruning to give an open top to the tree.

Mr. DEW said that some people thought it caused the branches to get sunburnt, but personally he was in favour of the top being kept open.

Mr. DE LITTLE asked with regard to laterals on plum trees, how many years they should be left on the tree after their first appearance.

Mr. Dew said the pruner must use his judgment. Laterals should be removed when required. It was a matter of governing the amount of fruit the tree was expected to bear; the tree should not be allowed to become crowded.

In reply to another question, Mr. DEW said that cherries should not be pruned, as gumming resulted.

United Peel River.

The monthly meeting was held on 10th April.

The bulletins on agricultural subjects sent by the Department to form the nucleus of a library were received and greatly appreciated by members.

A discussion took place on mixed farming, the opinion of members being rather varied as to what combination would be the most profitable in the district. The feeling was generally in favour of dairying as the main industry where lucerne could be grown.

The question of the ten or twelve worst weeds in the district and the best means of eradication will be discussed at next meeting.

Wollun.

The monthly meeting of the above branch was held on 12th March.

The correspondence included a copy of a report by Mr. Froggatt, Government Entomologist, on nasal fly, which was discussed with interest.

Yurrunga and Avoca.

At the meeting of this branch held on 13th March the principal item was an interesting and highly instructive address by a local dairy-farmer, Mr. J. Gilbert, on "How to successfully run a local dairy farm of 100 acres." The subject proved to be a very absorbing one, and drew forth a number of questions at its close, which were answered satisfactorily.

A Successful Dairy Farm of 100 Acres.

Mr. Gilbert prefaced his remarks by stating that he proposed to assume that a start was being made on one of the many farms that were now unproductive owing to being rabbit-infested, and that the person starting had sufficient capital to purchase a farm of that class and to keep things going till the first returns came in. Emphasis was laid on the point that it would be useless to commence stocking until some fodder crops were in sight, and the number of cows advised for a farm of this size was twenty-five; these must be of good quality, and in purchasing them Mr. Gilbert strongly advised enlisting the services of some competent judge if the purchaser was not one himself.

After wire-netting operations had been completed (and here some valuable advice was given about the extermination of rabbits), a start should be made to ensure winter feed by ploughing 12 acres in January to be sown at the end of March. He advised 11 acres of oats and 1 acre of swedes. Deep ploughing was strongly advocated—from 6 to 12 inches if possible.

Rabbit extermination and other work should occupy the interval till it was time to sow grass seed, which should be about March. Assuming that the paddocks had been denuded of herbage by rabbits, they should be run over with the spading harrow first, then sown and harrowed, the large wooden harrows being advised for the class of land under consideration in preference to iron ones. Paspalum should be given first place, being in Mr. Gilbert's opinion better in quality in this district than on the Richmond River, the growth not being so rank. The best and quickest method of establishing paspalum was by root-sets in spring, but failing that method, seeding would do. Cocksfoot, the merits of which were admitted, was also discussed, and advice given as to its planting.

Winter ploughing, to get ready for sowing summer feed, would be the next operation, and it was advised that in June, 5 acres be ploughed to a depth of at least 6 inches, to be dressed with blood and bone fertiliser in August, and then allowed to lie in fallow till November, when it could be sown broadcast with some variety of red maize, to be used for green fodder. Broad-cast sowing was advocated in preference to drilling, so as to secure a finer sample of stalk, which would not be injurious to the cows' teeth. The winter feed being ready, it would now be time to purchase the cows.

The rugging of cows during winter was highly recommended, and some useful advice was given on the method of making rugs at home that would be quite as efficient and durable as bought ones, the cost being practically only the labour of making.

It was advised that the bull should be of a kind that would produce good vealers, as it would not be profitable to raise heifers.

The next branch of the business—pig breeding and raising—was described as being of the greatest importance, and it was suggested that six brood sows and one boar of good class should be procured. It was held that with judicious feeding a net profit of £110 could be made on these pigs.

The April meeting of the branch was held at Avoca on 10th April, Mr. C. Wright in the chair. There was a good attendance of members.

Mr. F. McGrath, of Burrawang, gave an interesting address on "Vegetable Growing." He advocated deep and thorough cultivation and a liberal use of lime, ashes, and cowyard manure. He believed land in the district required a dressing of lime to ensure good crops. Methods of cultivation for the growing of parsnips, carrots, and other root crops were explained, and the opinion was expressed that onions could be successfully grown here. White Skin seemed the best variety to plant. Pig manure was the best for tomatoes, squashes, pumpkins, &c.

Orchard Notes.

W. J. ALLEN.

MAY.

Preparations for Planting and Pruning.

THE month of June is a favourable time for planting out deciduous fruit-trees, and it would be well if the land is not already prepared to put it in order with the least possible delay. The area to be planted should be cleared, well fenced, and worked to an even depth. Ascertain the varieties of fruits which find most favour on the markets, then select such kinds as will thrive best in the soil and climate. Lay the orchard out properly, giving the trees plenty of room, so that there will be a sufficient area from which they will draw moisture to keep them in good growing condition during dry years. After planting, keep the soil well worked around the trees, and apply a little mulch if available. Do every part of the work thoroughly, and you will not be disappointed with the ultimate results. Lime is beneficial to soils which are sour.

When planting out fruit-trees in the orchard, it should be remembered that each species of fruit has a liking for a particular class of soil. Peaches and Japanese plums, for instance, prefer a light, sandy soil, while apples and pears are more suited to the heavier and richer clay loams.

It should also be remembered when planting in the Tableland districts that the stone fruits are more liable to frost injury, and should, therefore, be planted on the highest portion of the ground.

Drainage.

In heavy retentive soils, the laying down of underground drains is a practice that can hardly be over-estimated. It permits of deeper rooting of the trees, allows of the soil being worked more quickly, and prevents souring. Tile drains are of the longest duration, and, although the most expensive in the initial outlay, they give best results. Tiles for main drains should be 4 inches in diameter. If the land to be drained has a rather steep fall, the drain should run diagonally across the fall of the hill. Temporary drains can be made of brushwood; these will last a few years, and can then be replaced with tiles.

Rabbit-proof Fences.

Whenever it is necessary to enclose the orchard with wire-netting, and this is a precaution which cannot be overlooked in many parts of the State, it is best to use a good wide netting with 1¼-inch mesh at the bottom. It is wonderful through what a small mesh a young rabbit will get, as well as how

high a fence he will scale, and if the orchardist wishes to preserve his trees from the attacks of these pests he must see that the orchard is securely enclosed.

Nursery Stock.

The wraps on all budded nursery stock may be removed any time now.

Ordering Trees.

If trees have not been ordered by intending planters, it should be done as early as possible now. There is always the risk when ordering late that the varieties required may have been disposed of.

Refilling Old Orchards.

Refills in deciduous orchards should be planted as early as possible, but in the dry districts old trees are better removed after the June and July rains. All trees that are to be re-worked should be marked.

Woolly Aphis.

Badly infested trees should be sprayed before pruning. Red oil emulsion is the best remedy for the woolly aphis at this season of the year.

Fruit Fly.

Be very particular to pick up all fallen and infected fruit. Kerosene traps are excellent means for catching the fly. Shallow tins are preferable to deep ones, and they should be hung on the sunny side of citrus trees. Adult flies on the wing are attracted by the kerosene, and quickly succumb. Saucers may be used if tins are not available.

Harvesting.

Lemons and mandarins will soon be ready for picking. Care should be taken in handling these fruits for market, and grading should be most carefully carried out when packing.

Passion Fruit.

Keep the fruit pulled regularly, as soon as it reaches a uniform black colour. Grade it nicely, and pack it in rows in the boxes. If growers are exporting any other fruit, it would be a good plan to send a few cases of passion fruit along in order to test their carrying qualities, as if we can successfully land this fruit on the markets of the Old World, and get it well introduced, there should be an unlimited demand for it. There are thousands of acres of land near the coast on which this plant does well, and where with proper attention it produces heavy crops of fruit annually.

Pruning.

Wherever trees are losing their leaves and showing signs of being dormant the pruning work may be commenced.

Varities suitable for the Northern and Western Suburbs of Sydney.

The following are recommended as suitable for planting in the suburbs mentioned:—

Apples.—Jonathan, Allsop's Early, Trivett, Pomme de Neige.
Apricots.—Camden Superb, Newcastle.
Figs.—Brown Turkey.
Guavas.—Purple, Yellow.
Lemons.—Lisbon, Eureka.
Loquats.—Herd's Mammoth.
Mandarins.—Emperor.
Nectarines.—Goldmine.
Oranges.—Washington Naval, White Siletta, Valentia Late.
Passion Fruit.—Common.
Peaches.—Edward VII, Triumph, Wiggins.
Persimmons.—Hachiya, Dai Dai Maru.
Plums.—Santa Rosa, Burbank, Wickson, Satsuma.
Quinces.—Portugal.
Sevilles.—Round, Flat.
Strawberries.—Creswell, Marguerite.

BULLS FOR SALE

AT BERRY EXPERIMENT FARM.

MILKING SHORTHORNS.—The Irishman (imp.) (495): date of birth, 12th August, 1911; colour, red, very little white; sire, Tipperary Bull; dam, Colleen Bawn (imp.), (1333 M.S.H.B.). Price, **40 guineas.**

Milk yield of dam :—	Milk lb.	Fat per cent.	Butter lb.
Colleen Bawn	6,937	3·8	309

Lord Gibson (636); date of birth, 11th December, 1913; colour, red, with white star; sire, Limerick Lad (imp.) (192 vol. iii, M.S.H.B.); dam, Lady Gibson (imp.), passed vol. iv, M.S.H.B., by Tipperary Bull, from Gibson Girl (imp.), (1,465 vol. iii, M.S.H.B.). Price, **20 guineas.**

Milk yields :—	Milk lb.	Fat per cent.	Butter lb.
Lady Gibson (imp.)	6,960	3·5	285 first calf.
Gibson Girl (imp.)	9,291	3·5	380

Prince of Temora; date of birth, 1st March, 1914; colour, roan; sire, Cameo of Darbalara, (154 vol. iii, M.S.H.B.); dam, Primrose VIII. of Darbalara (passed vol. iv., M.S.H.B.), by Emblem of Darbalara (100 M.S.H.B.) from Primrose of Bolaro, (568 vol. i, M.S.H.B.). Price, **15 guineas.**
No record of dam. Calf allowed to suckle.

Imperial Favour (653); date of birth, 19th May, 1914; colour, rich roan; sire, Imperialist (183 M.S.H.B.); dam, Mooki Favour (1604 M.S.H.B.), by Royal Duke 2nd (imp.) from Mooki Rose (487 M.S.H.B.). Price, **18 guineas.**

	Milk lb.	Fat per cent.	Butter lb.
Milk yield of dam (incomplete)	5,671	4·0	266·70

BULLS FOR SALE—*continued.*

HOLSTEIN—Major Spot (641): date of birth, 10th January, 1914; colour, black and white; sire, Cavalier; dam, Lolkje Field, by Garfield (imp.) from Lolkje, by Joubert, from Lolkje Veeman (imp.). Price, **18 guineas.**

Cavalier, as above.

Joubert by Obbe (imp.) from Schot V (imp.).

Milk yields:—	Milk lb.	Fat per cent.	Butter lb.
Lolkje Field	4,943	3·2	185
Lolkje	5,828	3·5	234
Lolkje Veeman (imp.)	11,996	...	479
Schot V (imp.)	9,110	...	288

JERSEYS.—Wagga Aeronaut (315); calved 20th March, 1914; colour, whole fawn; sire, Grenadier (imp.); dam, Wagga Aitua (787 A.J.H.B.). Price, **12 guineas.**

Wagga Commander (319): calved 10th June, 1914; colour, whole fawn; sire, Aitua's Lad; dam, Wagga Clover (781 A.J.H.B.); Aitua's Lad, by Kaid of Khartoum, from Wagga Aitua (787); Kaid of Khartoum, by Sir Jack from Egyptian Belle (382); by Tidy Punch, from Egyptian Princess (imp.) (65 A.J.H.B.). Price, **12 guineas.**

AT HAWKESBURY AGRICULTURAL COLLEGE.

RED POLL.—Belmont Ajax (No. $\frac{1}{82}$): calved 7th January, 1912; colour, red; sire, Acton Ajax (imp.) (9,655); dam, Shamrock, by Magician, (imp.) (5,021); from Spinster, by Laureate (imp.) (1,563) from Spot (imp.) (5,136 R.P.H.B.). Price, **30 guineas.**

AYRSHIRE—Ayrshire Lad: calved April, 1914; colour, brown and white; sire, Wyllieland Bright Lad (imp.); dam, Primrose II, by The General from Miss Prim, by Mischief-maker of Barcheskie (imp.) from Primrose of Barcheskie (imp.). Price, **12 guineas.**

	Milk lb.	Fat per cent.	Butter lb.
Milk yield of dam	6,420	3·6	271

AT GRAFTON FARM.

GUERNSEY.—Sunshine of Grafton: calved February, 1914; colour, lemon and white; sire, Sunshine; dam, Angelica of Richmond (imp.) (6 A.G.H.B.), by Governor of the Conture (1826 P.S.R.G.A.S.), from Angelica 8th (imp.) (4 A.G.N.B.), Sunshine, by King of the Roses (imp.), from Princess Vivid (156 A.G.H.B.). Price, **20 guineas.**

	Milk lb.	Fat per cent.	Butter lb.
Milk yield of dam (3 months)	2,211	4·65	122·39

AT NYNGAN FARM.

KERRY.—Sambo: calved 12th September, 1910; colour, black; sire, Bratha's Boy; dam, Darling, by Kildare II from Belvidere, by Kildare (imp.) from Belvidere Bratha 3rd (imp.). Price, **18 guineas,** delivered in Sydney.

GEORGE VALDER,
Under Secretary and Director of Agriculture

Government Stud Bulls available for service at State Farms, or for lease.

Breed.	Name of Bull.	Sire.	Dam.	Stationed at—	Engaged up till—
Shorthorn ...	Melba's Emblem (Vol. IV, M.S.H.B.)	Emblem of Darbalara (100 M.S.H.B.)	Melba 3rd of Darbalara (1058 M.S.H.B.)	Berry Farm ...	‖
,, ...	Imperialist ... (183 M.S.H.B.)	Florio	Lady Nancy of Minembah.	Berry Farm ...	*
Jersey ...	Grenadin (imp.)	Attorney (9477)	Cyril's Carnation (imp.).	Yanco Farm ...	*
,, ...	Trafalgar ...	Best Man ...	Rum Omelette	Cowra Farm ...	*
,, ...	Kaid of Khartoum	Sir Jack ...	Egyptian Belle	H. A. College ...	*
,, ...	Leda's Retford Pride.	Dinah's Lad ...	Leda's Angel..	Wagga Farm ...	‖
,, ...	Goddington Noble XV (imp.)	Goddington Noble	La Franchise 3rd.	,,	*
Guernsey ...	The King's Mirror	Calm Prince ...	Vivid (imp.)...	Woodburn ..	— Sept., '15.
,, ...	Star Prince ...	Calm Prince ...	Vivid (imp.)...	Wollongbar ...	†
,, ...	Godolphin Moses (imp.)	Golden Hero of the Vauxbelets (1929)	Rosetta (6509)	,,	†
,, ...	Hayes' Fido (imp.).	Hayes' Coronation 3rd.	Hayes' Fi-Fi 2nd.	Wollongbar Farm	‖
,, ...	Claudius (imp.)	Golden Star II..	Claudia's Pride (imp.).	Murwillumbah ...	30 June, '15.
,, ...	George III ...	King of the Roses	Calm 2nd ...	Wollongbar Farm	‖
,, ...	The Peacemaker	Calm Prince ...	Rose Petersen	Wollongbar Farm	*
,, ...	King of the Roses	Hayes' King ...	Rosey 8th (imp.).	South Kyogle ...	30 July, '15.
,, ...	Lauderlad ...	Laura's Boy ...	Souvenir of Wollongbar	Mullumbimby ...	6 Oct., '15.
,, ...	Belfast	King of the Roses	Flaxy 2nd ...	Tyalgum	28 May, '15.
,, ...	Royal Preel ...	Itchen Royal ...	Hayes' Lily du Preel (imp.).	Murwillumbah ...	30 Aug., '15.
,, ...	Alexander the Great.	Claudius (imp.)	Alexandrina of Richmond.	Warneton ...	27 Sept., '15.
Ayrshire ...	Wyllieland Bright Lad (imp.)	Wyllieland Gleniffer (7229)	Wyllieland Sangie	Glen Innes Farm..	*
,, ...	Isabel's Majestic	Majestic of Oakbank.	Isabel of Glen-eira.	Grafton Farm ...	‖
,, ..	Lessnessnock (imp.) (500 A.H.B. of A.)	Marshal Oyama (5841 A.H.B. of S.)	Bloomer B. of Lessnessnock.	,,	‖
Holstein ...	Sultan La Polka (imp. N.Z.)	King of Dominos (297 N.Z.H. & F.H.B.)	Princess La Polka (292 N.Z.H. and F.H.B.)	Berry Farm ...	*
Kerry... ...	Castle Lough Ranger (imp.)	Waterville Rover	Castle Lough Lizzie.	Bathurst Farm ...	*

*Available for service only at the Farm where stationed. † Available for lease or for service at the Farm where stationed.
‖ Available for special service where stationed upon application to the Under Secretary.

AGRICULTURAL SOCIETIES' SHOWS.

SECRETARIES are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 21st of the month previous to issue. Alteration of dates should be notified at once.

1915.

Society.	Secretary.	Date.
Dubbo P., A., and H. Association	F. Weston	May 5, 6
Clarence P. and A. Society (Grafton)	G. N. Small	„ 5, 6, 7
Hawkesbury District A. Association (Windsor)	H. S. Johnston	„ 7, 8
Lower Clarence A. Society (Maclean)	J. McPherson	„ 11, 12
Coonamble P. and A. Association	J. C. Wilson	„ 12, 13
Trangie P., A., and H. Association	A. K. Butter	„ 19, 20
Peak Hill P., A., and H. Association	A. Yeo	July 28, 29
National A. and I. Assn. of Queensland (Brisbane)	J. Bain	Aug. 9–14
Narandera P. and A. Association	H. S. Robinson	„ 10, 11
Trundle P. and A. Association	W. E. Herborn	„ 10, 11
Corowa P., A., and H. Society	J. D. Fraser	„ 16, 18
Gunnedah P., A., and H. Association	M. C. Tweedie	„ 24, 25
Murrumbidgee P. and A. Association (Wagga)	A. F. D. White	„ 24, 25, 26
Parkes P., A., and H. Association	G. W. Seaborn	„ 25, 26
Ariah Park P., A., H., and I. Association	J. E. Rowston	„ 31, Sept. 1
Grenfell P., A., and H. Association	G. Cousins	„ 31, „ 1
Narrabri P., A., and H. Society	D. J. Bridge	„ 31, Sept. 1, 2
Manildra P. and A. Association	A. Anderson	Sept. 1
Albury and Border P., A., and H. Society	W. I. Johnson	„ 7, 8, 9
Young P. and A. Association	T. A. Tester	„ 7, 8, 9
Cowra P., A., and H. Association	E. W. Warren	„ 14, 15
Cootamundra A., P., H., and I. Association	T. Williams	„ 14, 15
Canowindra P., A., and H. Association	G. Newman	„ 21, 22
Temora P., A., H., and I. Association	A. D. Ness	„ 21, 22, 23
Northern A. Association (Singleton)	J. McLachlan	„ 22, 23, 24
Yass P. and A. Association	E. A. Hickey	„ 29, 30
Tweed River A. Society (Murwillumbah)	A. E. Budd	Nov. 10, 11

1916.

Society.	Secretary.	Date.
Kiama Agricultural Society	G. A. Somerville	Jan. 26, 27
Southern New England P. and A. Association (Uralla)	H. W. Vincent	Feb. 29, Mar. 1
Tenterfield P., A., and M. Society	F. W. Hoskin	Mar. 7, 8, 9
Central New England P. & A. Association (Glen Innes)	G. A. Priest	„ 14, 15, 16
Armidale and New England P., A., and H. Assoc'n.	A. M'Arthur	„ 21, 22, 23, 24
Quirindi District P., A., and H. Association	C. G. Brandis	April 4, 5, 6
Upper Hunter P. and A. Association (Muswellbrook)	R. C. Sawkins	„ 12, 13, 14

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VOL XXVI. PART 6. JUNE 2, 1915.

Agricultural Gazette of New South Wales.

A Visit to Dr. S. M. Babcock at the Wisconsin University.

H. W. POTTS, F.C.S., F.L.S., Principal, Hawkesbury Agricultural College.

THE introduction of the centrifugal separator in 1885 proved the point at which co-operative butter factories were enabled to commence successful competition with private dairies in the separation of cream from milk, and the subsequent manufacture of butter.

At that time milk was purchased on the basis of gallon values, and in some countries by volume as weight, regardless of the fat content. Thus a proper commercial basis which determined the amount of butter to be made from a given quantity of milk was not in existence.

The co-operative dairy factory system, established in Denmark, had spread to America, Canada, Australia, New Zealand, and other countries, but its success was threatened by the unequal conditions prevailing amongst suppliers and the method of selling the raw product. Fraud became flagrantly apparent owing to the unscrupulous vendor obtaining advantages by skimming the milk or watering it. Moreover, no encouragement was afforded the progressive dairyman to deliver pure fresh milk containing a high percentage of butter-fat. He received the same price for his milk, averaging 4 per cent. fat, as the non-progressive supplier, whose milk only contained 3·4 per cent. fat. In those days it was not an uncommon sight to see leeches and young frogs in the sieves of the receiving tanks at the separating stations or factories—dumb evidence of the nature of the adulteration.

It thus became apparent that the success of co-operation in dairying was faced with a problem which jeopardised its existence.

In Wisconsin, U.S.A., in April, 1888, the late Mr. Hiram Smith, a prominent and progressive dairy-farmer, brought before the State Dairyman's Association a series of resolutions dealing with this serious phase of co-operation. As a result £300 was voted towards the expenses of conducting suitable investigations. The Director of the Wisconsin Agricultural Experiment Station, Professor Henry, the well-known author of the popular text-book "Feeds and Feeding," was approached, and he enlisted the services of Dr. Babcock, the station's chemist.

Other stations were undergoing similar difficulties, and this aspect of dairying had become a live subject for debate at all gatherings of shareholders. A number of chemists had directed their attention to the problem of providing a simple accurate method of quickly and easily analysing milk, in order to estimate the fat content, the idea being to purchase the raw

material on a fat basis. Several methods had been designed and published, all of which exhibited some defects, and failed to meet the exigencies of the situation.

It was at this time that Dr. Babcock took up the work. He carried out a prolonged and varied series of tests, and eventually divulged the result of his research in a Bulletin, published in 1890, entitled "A new method for the estimation of fat in milk, especially adapted to creameries and cheese factories."

The application of the test soon established its reputation as a complete solution of the troubles which confronted dairymen and manufacturers in dealing with milk, cream, and all the by-products of the factory. The simplicity of the test and the cheapness of the outfit appealed to everyone associated with the industry. The approximate accuracy of the returns in estimating the fat contents of milk and cream, and the closely comparable returns of the churn outputs, gave satisfaction and established confidence.

Amongst those interested in this work of solving early difficulties, the writer was engaged at one of the first butter factories established in Victoria, and wrestled with the various aspects of the situation. It was recognised that the commercial success of the industry was seriously threatened, just as it was in America, unless some reliable, cheap system of purchasing milk on a fat basis was discovered. Reprehensible and dishonest practices were as rife here as elsewhere, and the outlook was most discouraging. The capitalist began to look on the developing industry with suspicion, and the honest dairyman with disgust.

Similar checks were experienced in every country that followed the lead of Denmark.

Dr. Babcock's invention saved the situation, infused confidence, stimulated the industry, and attracted capital.

The test afforded a basis for a reliable organisation, and placed in the hands of men, not professionally trained, a readily-handled method of carrying on the industry on a truly business-like basis. Many of the details involved constant check, and hundreds of calculations had to be made to ensure accuracy. Trial checks between the churn returns and the estimates from the test were repeated at the Wisconsin laboratory for five months. Many failures were encountered, and disappointments had to be faced before "payment by results" became a fixed policy in the conduct of the affairs of butter and cheese factories, but co-operation in the manufacture of dairy products has now become firmly founded through the adoption of Dr. Babcock's system, and the Association of Official Agricultural Chemists in the United States and Canada has officially adopted it as a standard method. It is used in the butter factories of Germany, England, Denmark, Finland, Russia, and Argentina, as well as Australia and New Zealand. In point of fact, the use of the Babcock tester became general in our factory system in Australia and New Zealand before it did in other countries, including the United States.

As with the milking machine, dairy people here have always exhibited praiseworthy enterprise in submitting to trial any invention that is likely to aid our primary industries.

It is not in relation to co-operative effort only, however, that the test has proved valuable. Its application to the product of individual cows, together with the scales, has proved an influential factor in uplifting the dairy industry throughout the world. It has enabled the average dairy-farmer to select the best cows in his herd for both milk and butter. It teaches him how feeding may be more economically conducted. It shows him the most eligible cows to breed from. It makes him more observant. It provides the cattle-breeding associations with definite information relating to performances in pedigreed stock. It ensures a more accurate knowledge of the business aspect of dairying.

After twenty-two years' experience, the claim is legitimately made that the average yield per cow has been substantially raised, and the profits of the dairy farmer increased.

It is almost needless to state that when visiting America, the writer looked forward with great pleasure to the opportunity of personally meeting the scientist who had so singularly benefited one of the most valuable of our Australian primary industries. On reaching his laboratory at the Wisconsin University, Madison, on the 24th August, 1914, we found the genial Doctor in the midst of research work. He entered into a discussion of our early experiences and the difficulties he had had to overcome in arranging his system of payment by results, with a charm and readiness of description that was quite refreshing. No detail was too small or elaborate, and when we consider it is twenty-three years since the investigation was taken in hand, one could not help noting the marvellous power of memory evinced.

The outcome of the encouragement given to the dairying industry in Wisconsin by Dr. Babcock's invention was an application by Professor Henry, the Dean of the Agricultural College, for enough funds to establish a dairy school and to initiate systematic training to render students competent to perform the duties of managers and manufacturers in butter and cheese factories. It was soon recognised that to control a factory on economic lines, managers must have a training in engineering, mechanics, physics, dairy chemistry, dairy bacteriology, ripening of cream, and butter and cheese making. Professor Henry and Dr. Babcock started a school with a six months' course, and they were the original lecturers. They had the use of an old one-storied building which they fitted up under conditions demanding rigid economy.

The first class numbered two students, one being Professor Decker, the well-known cheese expert and author. On the completion of the course these two young graduates went forth to justify in commercial butter-making the training they had received in the laboratory. Their work quickly attracted attention and reflected credit on their professors, and this, in combination with the persistent public appeals for increased support made by

Professor Henry, resulted in the following season's session opening with seventy-five pupils. It was impossible to ensure efficient training in the improvised dairy school and factory. The lectures were given to the class as a whole, but all demonstrations and practical work had to be arranged for classes of not more than twenty-five pupils, so that each demonstration had to be repeated thrice daily. This proved trying to the small staff, and Professor Decker was engaged to teach cheese-making. Subsequently Professor Farrington was appointed head of the school. He is known to all dairy students as joint author with Professor Woll of the text-book "Testing Milk and its Products."

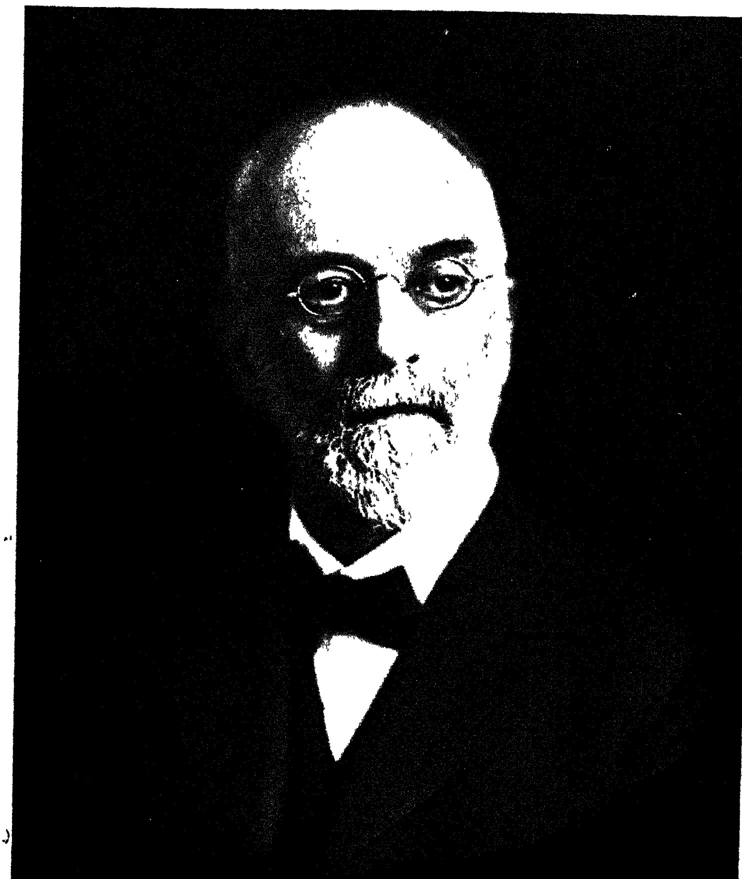
During this strenuous period, Professor Henry never lost an opportunity of urging the State legislature to make more permanent provision to carry on this work, and the representatives were induced to visit the school, to note its crowded state, and to recognise the need for financial help. The sum of £5,000 was promptly provided for the purposes of building a dairy school. This was supplemented by a vote from the regents of the University, and a substantial and imposing four-storied building with power-house and factory was erected. It was called the Hiram Smith Dairy School. It has since been largely added to and adequately equipped with the most modern machinery, appliances, lecture-rooms, and laboratories. It is fitted up for the teaching of every phase of dairy work. The staff has increased in number, and up to date over 3,000 graduates have qualified.

Dr. Babcock continued his work as a teacher until ten years ago, when he was relieved, and he has ever since devoted himself only to research. In this direction he has repeatedly come forward with valuable suggestions to manufacturers and dairymen.

In conjunction with Dr. Russell, College Bacteriologist and now Dean, he inaugurated a series of investigations relating to ripening cheese in low temperatures. Practical cheese-makers averred that this was not feasible, and declined to listen to any reasons in favour of the new proposals, but certain ascertained facts induced the investigators to pursue the method at temperatures ranging from 40 degrees to 60 degrees Fahr. At one dairy conference held in Madison, Dr. Babcock attended with a number of cheeses ripened under cool-storage conditions. These were critically examined and tested by cheese manufacturers present. The best was selected unanimously for quality, and it proved that it had been ripened at a temperature of 40 degrees Fahr.

This decided the practice, and from that day forward the ripening of cheese in low temperatures has steadily gained favour. It has led to greater uniformity in the development of flavour and condition.

These scientists have also been engaged in conducting tests leading up to the manufacture of cheese on more scientific lines by pasteurisation of milk and its inoculation with pure starters. These experiments have met with sound results and have proved very interesting. They are now assembling evidence to show that the acidification of milk prior to renneting can be best secured by the addition of commercial acids.



Dr. S. M. Babcock,
Emeritus Professor of Chemistry,
Wisconsin University.

Staff of the University of Wisconsin Agricultural Experiment Station.

Back Row (standing), Left to Right—D . H. L. Russell, Director. Y. C. Humphrey, Professor of Animal Husbandry. E. B. Hart, Chemist. A. R. Whitson, Soil Physicist. D. H. Otis, Professor of Animal Nutrition.

Front Row (sitting), Left to Right—C. A. Ocock, Agricultural Engineer. F. W. Woll, Chemist. W. A. Henry, Emeritus Professor of Agriculture. S. M. Babcock, Emeritus Professor of Chemistry. E. H. Farrington, Professor of Dairy Husbandry. A. S. Alexander, Professor of Veterinary Science.

Dr. Babcock's reminiscences carry one over the period involving the initiation and successful application of the modern system of dairying, in which he has played such a substantial part. He is a true scientist, and has emphatically demonstrated by his life-long devotion to research in the arena of applied science that unselfish spirit which has adorned the livos of great men.

Few could have resisted the opportunity of acquiring a handsome competence out of his scientific discoveries. Had he secured the patent rights of his best-known invention, his retirement from active life was assured. This he declined with characteristic modesty and unselfishness, and the producers of the world have benefited by his noble spirit and ideal generosity.

The only public recognition acceptable to this great man was the action taken by the Legislature of Wisconsin in 1899, when it agreed to have a bronze medal struck to commemorate Dr. Babcock's services. This was presented to him at the bar of the Legislature during the session of 1901. The medal bears the following inscription :—

> "Recognising the great value to the people of this State and to the whole world of the inventions and discoveries of Professor Stephen Moulton Babcock, of the University of Wisconsin, and his unselfish dedication of these inventions to the public service, the State of Wisconsin presents to Professor Babcock this medal."

Appreciation of Dr. Babcock's services was also evidenced in a manner very pleasing to Dr. Babcock in 1900 and 1901, when the dairymen of New South Wales, Victoria, and New Zealand sent him an oil painting representing an Australian dairy scene, and a series of water colours of New Zealand scenes.

One of the curios in the main laboratory at the dairy school is the original testing machine, manufactured to the order of Dr. Babcock, and illustrated in Farrington and Woll's text-book. It has been to several exhibitions, such as Chicago, St Louis, and Paris. At the last two the Grand Prize was awarded to Dr. Babcock. This testimony to the brilliant and unselfish labours of a great man would not be complete without reference to the importance of his work to Australia and New Zealand. In saying good-bye, he especially requested the writer to convey to the dairymen of this side of the equator his hearty good wishes and best regards.

Pure Berkshire Boars and Sows for Sale.

Young Boars and Sows by "Hawkesbury Augustus" (imp.) from selected Sows by "Yarra" and "Manor Captain" are for sale at the Yanco Experiment Farm. Application should be made to the Manager.

Scrub-cutting for Sheep Feed.

CHAS. J. WOOLLETT, Inspector of Stock, Cobar.

DURING the last three years droughty conditions have prevailed practically over the whole of the Western Division of the State.

The conditions vary considerably in different districts. Owing to the large areas, portions of runs may have plenty of feed, whilst in others there is a great scarcity of grass and herbage. Unfortunately, it frequently happens, too, that large tracts of country, comprising many runs, are totally bare of feed, except for the edible trees. In fact, the forage plants are the sheet-anchor of the western grazier. Through lack of supervision, however, many of these trees are destroyed, and parasitic diseases are claiming many thousands. Conservation might well be the watchword of the landholder. The establishment of reserves of edible trees along travelling stock routes would minimise the risks of loss while droving sheep during periods of drought.

The writer has unique opportunities of studying the efforts of stock-owners to keep their stock alive, and observing the varying results obtained. As in everything else, some make a poor showing, whilst others are eminently successful.

It is with the object of helping those who have not had the opportunities of seeing how others manage their stock in time of drought that the following notes are written.

If stock are allowed to get weak and low in condition before commencing the hand-feeding, the results will not be very satisfactory. "Scrubbing" for strong sheep will, in the end, give better results at much less cost in the aggregate than waiting for rain and allowing the stock to get weak, even though money is apparently being saved.

Results in the Cobar District.

The results obtained by two sheep-owners in the district speak for themselves. One commenced scrub-cutting, mostly mulga, in May last year for 3,000 strong 4 and 6-tooth wethers. Two extra good, conscientious men were employed, and were paid 35s. per week and found (the latter costing 15s. each per week). They cut till September, with a loss of only 2 per cent. of the sheep—a loss that might be expected in normal times. From October till January of this year, four men cut for 6,000 mixed sheep. After shearing, losses were suffered through a cold snap, but the total losses were only 8 per cent., which must be considered a very good result.

The other sheep-owner fed about 8,000 sheep for eight months, employing six men. He paid £2 a week and keep. However, he had abundance of good edible plants—kurrajong, mulga, supple-jack, currawong, bluebush, and others.

The losses were 500, which, considering that the flock consisted of mixed lambs and sheep of all ages, is also a remarkable result. The illustration gives an idea of the condition of these sheep.

Where a mixture of plants was not cut daily, the results were not altogether satisfactory. The reason is quite evident. The nutritive values of these plants vary considerably, and by mixing them a balanced ration is more likely to be obtained. The amount cut would be only a subsistence ration, for owners never attempt to more than keep the sheep alive when "scrub cutting." There is also the matter of digestibility and palatability of the fodders When human beings are confined to one kind of food, digestion becomes impaired, and they soon tire of it. It is only reasonable to suppose that the same thing applies to stock. Animals restricted to one kind of fodder for a lengthened period have their vital processes upset.

Ewes and lambs on Kurrajong.

Illness due to Scrub-feeding.

During this year the writer was instructed by the Chief Inspector of Stock to proceed to another district to investigate a peculiar illness amongst sheep. The following is a copy of the report submitted thereon :—

"The sheep in question were 4-tooth ewes and wethers, the different sexes running in separate paddocks, each mob of about 4,000. One paddock is 28,000 acres in area, ringbarked, with not a vestige of grass or herbage, but an abundance of kurrajong, with an occasional currawong, emu, currant, and

bluebush. This is the paddock I saw. The water had given out in the paddock, and it was when mustering began that the condition of the sheep was ascertained. They were in good store condition, and when seen in the paddocks would make off as though nothing were amiss. None were found dead in the paddocks, and it was only after being forced when driven that any would die. The manager informed me that of 1,000 ewes mustered and removed in one lot, they dropped 125 after travelling a short distance, and five died. He states that the condition of the ewes is worse than the wethers. Scrub-cutting for the ewes has been going on for some time, and kurrajong is the only tree cut or lopped. The wethers have been subsisting on fallen kurrajong, leaves, flowers, and now on young green pods which are falling abundantly. Whilst the wethers were under observation I noticed they freely ate pine leaves. There was evidence, too, that the sheep had trimmed up the

Method of climbing Kurrajong.

lower branches of pine in the paddock. I did not see the ewes, and only 125 wethers, but as the symptoms were typical of the others, this was considered sufficient.

"The sheep were let out of a brake after an all-night camp, and before they had travelled half a mile the symptoms were manifest. They were fairly regular in their order of sequence. A violent wagging of the tail would commence, and the back would be humped and the sheep stand, trembling in

the region of the back and loins, and micturate a little. When walking, flexion of one, sometimes of both, hocks would disappear, with consequent dragging of the hind legs and knuckling of the fetlock joint. Sometimes a stifle would appear stiff, and then the sheep would hop on three legs. If still forced along sometimes the fore legs would become stiff, and then the sheep would have the appearance of walking on stilts. The sheep would lie down, and when picked up would run, perhaps, 20 yards as though nothing was wrong. Frequently after a sheep was picked up signs of urination were seen. The worst cases were carried in a waggonette for some distance and then put down. At least forty of the 105 were affected in the time I followed them. As the sheep were carefully driven there were no deaths. A sheep badly affected was killed, and on examination I only found the kidneys and lungs abnormal. The mucous membrane of the trachea and bronchial tubes was inflamed, and the lungs showed numerous patches of extravasation of blood in the tissues. The paunch contained large numbers of kurrajong pods, seeds, and leaves, but no pine leaves were seen. The contents of the other portions of the stomach were quite normal, as were the intestines.

"By cutting the young green pods and seeds of kurrajong in various ways, it will be noticed that they contain a sticky resinous exudate—possibly capable of setting up the conditions. Or maybe the kino of our pine (*Callitris sp.*) may contain a body capable of producing the conditions as set out above. I am of opinion that the condition is caused through the ingestion over a lengthy period of a ketone—a turpentine—from either or both pine leaves or kurrajong pods. This conclusion is based on the fact that our pines do contain a turpentine; kurrajong pods probably do also. It is an established fact that turpentines are eliminated by the kidneys and lungs, hence their condition through excessive excretion. Turpentine in excess also has an effect on the brain and spinal cord, hence the nervous symptoms."

Whether my deductions as to the actual cause of the trouble will be borne out by research remains to be seen. However, it is tolerably certain that the lack of variety in the food played a by no means unimportant part.

Good Water Supply Desirable.

Ample provision should be made for conservation of a good water supply. Where paddocks were small the results were generally satisfactory, but when stock have to travel long distances to water the energy obtained from the food is spent in walking, and very little is conserved in the animal body to repair the ordinary waste that is going on in the tissues. A plentiful supply of water would help to keep the urinary organs in good condition—a most important matter where hand-feeding is resorted to.

Precautionary Measures.

Where there is a lack of succulent food, there is a tendency in all animals to constipation. The writer has noticed strong sheep affected with impaction of the bowels, due to dry feed, and they invariably die. How can it be

avoided under drought conditions? Simply by providing coarse salt and magnesium sulphate (Epsom salts). Rocksalt does not serve the purpose nearly so well. About 5 lb. of Epsom salts and 5 lb. of sulphate of iron to 100 lb of coarse salt, placed in troughs near tanks, will be found to have the desired effect. The iron will act as a blood tonic, and give tone to the system. The salt acts as a mild cathartic.

Weak sheep and cattle should be separated from stronger animals, and fed by themselves. This is most important, for if they are allowed to feed together the strong ones get most of the feed, and knock the weak ones about in their scrambling round. It is quite an easy matter to cut the "tailers" off.

An old Kurrajong tree before lopping.

Before scrub-cutting on Crown lands is commenced, owners should get a permit, though this is frequently neglected. It appears necessary that drovers in charge of travelling stock should obtain a "Products License" under the Forestry Regulations before lopping edible plants on stock routes, if they want to keep within the pale of the law.

Experience with Various Trees.

The plants usually cut for fodder are kurrajong (*Sterculia diversifolia*), mulga (*Acacia aneura*), leopardwood (*Flindersia maculosa*), rosewood (*Heterodendum oleæfolium*), whitewood (*Atalaya hemiglauca*), emu bush (*Eremophila*

sp.), supple-jack (*Ventilago viminalis*), currawong (*Acacia sp.*), beefwood (*Grevillia striata*), ironwood (*Acacia excelsa*), quondong (*Fusanus acuminatus*), currant-bush (*Apophyllum anomalum*), and wilga (*Geijera parviflora*).

Through lack of knowledge of western conditions, drovers and others have had more or less serious losses from time to time. Starving stock will eat almost anything, and a few notes on plants likely to cause trouble may not be out of place.

Ironwood, although protected by the "Forestry Act, 1909," is not looked upon very favourably by stock-owners. Some time ago 3,000 sheep died on a station, and it was alleged that the losses were due to feeding almost

The same tree after lopping.

exclusively on this plant. The leaves, or more correctly the phyllodes, contain very little moisture, and would readily cause impaction. It is now a generally accepted fact that old straggling ironwoods, after seeding, are relished by stock if given sparingly.

Recently 106 out of 5,000 travelling sheep died after feeding on rosewood when hungry. The leaves of this plant are succulent, and when very hungry sheep are fed on them they are liable to be blown. When scrub-cutting has to be resorted to for travelling stock, it would minimise the risk if the cutters were a day ahead of the stock. The leaves would then be partially wilted, and the danger of hoven would be reduced.

In the February issue of the *Agricultural Gazette*, Mr. J. H. Maiden drew attention to a suspected creeper of the west. Its foliage covers dead trees, and when cut provides splendid feed. It does not seeem to have a vernacular name, but its botanical name is *Lyonsia eucalyptifolia.*

Stock are very fond of this creeper, but it is considered dangerous if hungry cattle or sheep are fed on it when freshly cut. If allowed to wilt for twenty-four hours before feeding, there is no danger. It is the consensus of opinion in the west that this creeper is one of the most nutritious and palatable forage plants we have. Feeding hungry stock on the "King of Fodders" (lucerne) is not unattended with risk, especially if it is damp. Yet no one denies the value of lucerne if fed with proper safeguards.

Yet another example of the disastrous results following the feeding of starving sheep on succulent plants may be mentioned. A mob of 3,000 starving sheep were recently put in a brake over night. There was a luxuriant growth of pig-weed (*Amaranthus viridis*) in this enclosure, and next morning over 1,000 of the sheep were found dead.

The value of wilga as a fodder is considered very small; it also is protected. The country here is "red," and rarely is there evidence of sheep having eaten it. Round tanks, the lower limbs are sometimes trimmed. It is said that wilga growing on black soil is readily eaten by stock. However, the writer recently met a drover with starving sheep, and he was cutting wilga on "red country." He informed me that it was his practice to cut old straggling wilga, and the sheep relished it. Being an elderly man, with long droving experience, this hint should be useful to young drovers when forced to cut fodder for the stock. Sometimes he found stock would not touch it, but that was not often.

There are many lessons which may be taken from the drought, and the one we have been considering is important. It is hoped the above may prove useful.

SEED TESTING FOR FARMERS.

THE Department is prepared to test vegetable and farm crop seeds. Reports will be given stating the germination capabilities of the seed, its purity, and the nature of the impurities, if any.

Communications should be addressed to the Director, Botanic Gardens, Sydney. Not less than 1 ounce of small seeds such as lucerne, or 2 ounces of large seeds like peas, should be sent. Larger quantities are to be preferred. Seeds should be accompanied by any information available as to origin, where purchased, age, &c.

If a purity report only is desired, it should be so stated, to secure a prompt reply. Germination tests take from six to twenty days, according to the seed.

The Pollination and Fertilisation of Maize.

H. WENHOLZ, B.Sc. (Agr.), Assistant Plant Breeder.

The Botany of Fertilisation.

THE formation of the seed of maize depends, as with other plants, on the union of a male reproductive cell with a female reproductive cell.

The so-called "pollen dust" consists of countless numbers of pollen grains, each of which contains the male reproductive cell. These pollen grains are formed in three stamens which are enclosed by a pair of glumes, each set of stamens with its accompanying glumes forming a separate male flower. The tassel of the maize plant contains large numbers of these male flowers, which are usually in pairs along the spike-like branches of the tassel. When ripe, the pollen bags (anthers) of the stamens hang out of the glumes, and burst near the top in a longitudinal slit. This allows the pollen grains to escape and to be blown about by the wind.

The "silk" consists of a more definite number of strands or "styles," each clothed with numerous fine hairs, and each attached to an organ (the ovary) at the base of the cob. This ovary consists of a mass of tissue enclosing the female reproductive cell (the ovule). The ovary tissue in its turn is attached to the cob or core by a narrow strip of connective tissue, which, when the seed is ripe, becomes quite hard and brittle enough to break across when the ear is shelled.

The pollen grains blowing about in the air become caught in the fine hairs on the styles of the silk, and it is only necessary that one pollen grain should fall on each style of the silk in order to fertilise its ovule. The number of these styles of the silk is the number of grains on a full ear. On the other hand, the number of pollen grains produced runs into millions, but by far the greater number of these do not reach the silk, falling to the ground as they are blown about by the wind.

The structure of the ear is such that the female flowers are produced on it in double rows, and it is, therefore, as impossible to get an odd number of rows round the ear as it is impossible to get less than two flowers in a spikelet of common (dicoccum) wheat. It is not, as some think, a matter of chance as a result of fertilisation.

The union of the male reproductive cell contained in the pollen grain is effected with the female reproductive cell at the base of the silk style by the pollen grain germinating and sending down a pollen tube through the tissue of the silk style, through which the male reproductive cell passes.

Cross-fertilisation the Natural Method.

As with most plants that have their male and female organs in separate flowers on the same or on different plants, fertilisation is largely effected

between different plants, *i.e.*, the pollen from one plant falls on the silk of a different plant and fertilises its ovules; this constitutes cross-fertilisation If the pollen from the tassel falls on the silk of the same plant, self-fertilisation occurs. As it has been observed from world-wide experiment that continued self-fertilisation causes loss of vigour in the progeny, while cross-fertilisation maintains or increases the vigour, and as it undoubtedly appears, when the male and female flowers are separate, that Nature intended cross-fertilisation for the plant, it will be interesting to examine some of the provisions which are made by Nature to ensure this desired result.

Adaptability to Cross-pollination.

In the first place, it will be noticed that the tassels at the top of the stem are produced, and that some of the pollen is ripe and is already shed before the silks appear from the top of the husks which arise from one or more of the leaf axils, usually about the middle of the stalk. The silks from the butt of the cob are the longest, and are the first to push out of the husk, and by the time the last silks emerge (the short styles from the top of the cob) the tassel of the plant has finished shedding its pollen. This is the general rule, but it has variations, which will be spoken of later on. It will be seen, however, from this general rule, that, from the tip of the ear to varying lengths down the ear, as far as about half-way, the grain must necessarily be the result of cross-fertilisation, though it must not be inferred that from the butt upwards to this point the grain is the result of self-fertilisation.

Nature guards against Self-fertilisation.

True, this part of the cob is usually silking at the same time as the pollen of the plant is ripe, but Nature guards against self-fertilisation in two ways:—

(1) Although the stamens hang downwards when ripe and the anthers have burst, the pollen does not readily fall out. This fact can be noticed in the calm of the early morning, before any breeze has sprung up. On the slightest zephyr, however, the pollen is dislodged in "clouds of dust." But this gentle breeze, combined with the lightness of the pollen, is also sufficient to so counteract the force of gravity as to prevent the "dust" from falling vertically upon the silk of the same plant; actually, it removes it sufficiently in a horizontal plane to carry it to the silk of a neighbouring plant. A stronger breeze will, of course, carry the pollen much farther.

(2) It may sometimes happen that some of the anthers themselves will drop off with a large number of pollen grains still adhering to them, and the force of gravity, having more influence on such a comparatively heavier body in a very light breeze, will cause some of these anthers to drop almost vertically downwards. But if we could look down the maize plant from above, we would see that the silk is in most cases perfectly invisible, being hidden from view and protected from vertically falling pollen by two or more broad leaves, which arrest the progress of these pollen-laden anthers. Evidence of this will be found in the mass of anthers and pollen in the leaf axils, *i.e.*, at the junction of the leaf and its sheath surrounding the stem.

Assisting Nature by Artificial Selection.

It is quite possible that Nature, if left to herself, will, by elimination of the "unfit" (the self-fertilised grain in the case of maize), produce the "fit" because of the gradual weakening due to self-fertilisation. But natural selection is a very slow process, and we may, by artificial selection, get better results in a very much shorter time. Artificial selection can not only produce the "fit," but can also evolve the "fittest" much more quickly than Nature.

Now, it will be observed that there is between individual maize plants of the same variety a great variation in width of leaves, and, as wide leaves are more likely to hide the silk beneath from vertically falling pollen, this is a point the observance of which should be of some value in making field selections of seed ears. The writer has noticed that where the silk is exposed to pollen from the tassel of the same plant, it is due in many cases to the insufficient width of the leaves. As wide leaves are frequently associated with vigour, the greater insurance that they offer against self-fertilisation may be partly the explanation.

Another point which has been observed is that some ears do not lie in the same vertical plane as the leaves, but protrude at an angle to that plane, so that the tip of the husk where the silk appears would be quite visible on looking down the plant from above; the silk is then open to receive any pollen that is falling vertically from the tassel of the same plant.

There is still another direction in which we can assist Nature in reducing the number of self-fertilised ears. Reference has already been made to the quantity of pollen and anthers which collect in the leaf axils. It has been observed that some plants push out the silk from the top of the husk right in the very axil, whilst in other plants the top of the husk is well above the axil when the silk emerges. In the former plants the emerging silk picks up the pollen lying in the axil, and is undoubtedly self-pollinated before it has had a chance to be cross-pollinated. It has been demonstrated by pollinating and covering the newly emerged silks, that they are receptive at this stage, *i.e.*, they are in a suitable condition for the pollen grains to germinate and send down their male reproductive cells to unite with the female cells. To this it must be added that once pollination is effected, fertilisation is very rapid, particularly in the maize plant.

The silks which are pollinated in this way are the butt silks, these being the first to push out from the husk, but in some cases there would be a sufficient number of silks pollinated in this way to extend some distance up the ear. May not this self-fertilisation explain in some measure the lack of vigour shown in plants arising from butt grains, especially as the latter have size in their favour, for, other things being equal, there is a close relation between the size of the seed planted and the fertility of the plant produced?

But what concerns us here is how to detect plants which have silked in this manner when selecting in the field at harvest time. It is not intended that one should go through the field and mark all such plants at the silking stage. Here a correlation comes to our assistance in the fact that ears that have thrown out their silks right in the axil are usually short-shanked when

mature, whilst those that have pushed out their silks from the top of the husk when the latter is well above the leaf axil are mostly long-shanked ears. The shank, it may be explained, is the term applied to the stalk which supports the ear from the point of attachment to the main stalk of the plant to the base of the ear. It seems, then, that to avoid self-fertilised grain on the lower part of the ear, the selection of short-shanked ears must be discountenanced. This discrimination can, of course, only be made by selection in the field. Ears with long shanks have the additional advantage that they tend to hang down at maturity rather than to stand erect and allow moisture to enter in wet seasons.

Plants Silking before Tasselling.

Plants have been noticed in the field which commence silking before tasselling, in a few cases before the tassel itself appears, but in a comparatively greater number before the pollen is ripe enough to be shed. What is the significance of this reversion of the general rule? The following few figures, taken with regard to the time occupied in silking and tasselling of *individual plants* at Grafton last season, will help us to understand what is likely to happen in these cases:—

	Days.
Length of time between tassel heading and shedding pollen	1 to 4
Period of tasselling, *i.e.*, shedding pollen...	9 ,, 10
Time between appearance of husk and appearance of silk	7 ,, 9
Period of silking	8 ,, 12
Time between commencement of tasselling and silking ...	0 ,, 10
Time between silking and tasselling, when silk appears first	0 ,, 5
Time between silking of two cobs on same stalk... ...	1 ,, 3

From an examination of plants which silk before they tassel (the term "to tassel" is retained to mean "to shed pollen," while "heading" is the term applied to the first appearance of the tassel), it appears that the first emerging silks (butt silks) thereby increase their chances of cross-pollination, since self-pollination is for a time impossible. From the figures given above it will be seen that the silk may be "out" up to five days before the same plant tassels. Seeing that the period of silking lasts from eight to twelve days, in five days the silk will be about half "out," so that about half the ear (the lower half) has a chance of being cross-fertilised in some cases. But these cases are in a distinct minority. With most of the crop the lower grains stand the biggest chance of being self-fertilised, since it is during the first part of the silking that the tasselling and silking periods of the same plant overlap.

Effect of Suckers on Pollination.

What we know of suckers up to the present is that their numbers in a crop are determined by the variety, the season, the fertility of soil and thickness of planting, and by heredity. It will be seen that they depend partly, but not wholly, on outside factors.

The height of the sucker varies usually with the time at which it "comes away." An early suckering plant has suckers almost as tall as the main

stalk, and the height generally diminishes in proportion to the lateness of "budding off." As regards pollination, we need not concern ourselves with suckers thrown out so late that in height they do not reach the silk of the main stalk, for practically no pollination can result from the tassels of such suckers.

As all suckers usually tassel later than the main stalk, and in such a position that the leaves of the main stalk have no effect in preventing them from pollinating its silk, it is likely that in a very light breeze a good deal of pollination from the tassel of the sucker to the silk of the main stalk occurs, especially during the latter part of the silking Thus the upper part of the ear, and especially the tip grains, are open to a fair amount of self-fertilisation. It is probably this fact, in conjunction with the smaller size of the tip grains, that causes them to be regarded with disfavour for planting, apart from the irregularity they cause in dropping from a planter.

Tip-filling of Ears.

This raises the question as to the advisability of dogmatically describing as good seed-ears those which have well-covered tips. They may be pleasing to the eye and win prizes at shows, but it has yet to be shown that ears with well-covered tips will yield better than those whose tips are bare of grain.

In order to fully consider this aspect of the subject, it will be necessary to go over the ground giving the reasons why the tip is filled. In the first place, if the plant has no suckers, it must, as mentioned before, depend in the majority of cases on cross-pollination for the last emerging silks, in order to have the tip of the ears filled with grain. But as these tip grains are removed before planting, there is no particular advantage in using such an ear if it is not up to standard size. The writer has seen men selecting corn who would sacrifice size of ear in order to get one with the tip nicely filled.

Suppose, secondly, that the plant has suckers, then it is likely that the tip-filling will be due to self-pollination from the tassels of these suckers. This certainly means more grain per ear, but as far as we have observed up to the present, the best and heaviest ears are produced on plants which have no suckers. This is especially the case in a season which is good during the first part and dry during the latter part. However, the question of suckers is one that has not been fully worked out, and it requires still further investigation.

A Guide to Selection for Early or Late Maturity.

Let us now look more closely into the case of tip-filled ears on suckerless plants. Here, in the majority of cases, the tip-filling depends on cross-pollination. Cross-pollination by what? Certainly it must be by later tasselling plants. This means that the ear with a well filled tip on a suckerless stalk is likely to have "silked" early, compared to the general crop. When selecting for earliness in short-season districts, this may be a point of some value in the final selection of ears for planting. But on the Coast, and especially on the North Coast, there is no doubt that for high yields more advantage should be taken of the longer growing period. Here it is very questionable whether the selection of ears with well filled tips is an advantage, in spite of their

æsthetic value in show exhibits. A question of more importance is, "Which seed-ears will give the highest yield?" A poorly filled tip is usually an indication that such ears are slightly later maturing than those with well filled tips, since apparently no pollen is available to fertilise the last appearing silks (the tip silks). This year's ear-to-row test with the late variety, at Grafton, includes several good heavy ears with poorly filled tips from late suckerless stalks, and it is expected that they will give a good account of themselves.

A Constitutional Defect.

In connection with tip-filling, mention must be made of a type of badly filled tip which is due to a constitutional defect, viz., the formation of male flowers instead of female at the tip of the ear. When the ear has been harvested and husked, the glumes and anthers of the male flowers have disappeared, leaving little trace of their former presence, but ears possessing the defect described may be distinguished from those with badly-filled normal tips, resulting from lack of pollination, by the still persisting, though withered, silks. Such ears should be studiously avoided in selection, not only because the characteristic will be largely inherited by the progeny, but because the "barren area" may gradually increase in extent, and also because of the likelihood of self-pollination of the whole ear from these male flowers in the upper part.

Barren Stalks.

Reference should also be made to the question of barren stalks in regard to pollination. It appears that a distinction must be drawn between truly barren stalks, *i.e.*, those which produce no cob at all nor any sign of one, and so-called barren stalks which do make some attempt at cob-production, and bear little or no grain ("nubbins" or "blind ears"). They have one point in common, viz., that before the tassel begins to shed its pollen, it is practically impossible to tell whether the stalk is going to be barren by the absence of any sign of protrusion of the silk from the husk, or, in many cases, by the absence of any sign of the husk itself. The absence of the silk or even the husk at this time may, however, be no cause for concern, especially if the plant be early in tasselling, for the silk often emerges later, and yet is in time for pollination from later tasselling plants. Such plants may be a valuable provision on the part of Nature to ensure cross-fertilisation, and as such plants are often detasselled for fear they will spread their "apparent barrenness," this valuable provision is lost if the ears of such plants are not selected for seed. It may be said, however, that in the case of truly barren plants, detasselling is a wise procedure. Therefore, the best advice that can be offered is to detassel all apparently barren plants in the seed-plot, and if the detasselled plants later on produce an ear, this should be rather a valuable one to breed from. In view of what has been said before on the subject of plants silking before tasselling, it seems theoretically as if most cross-fertilisation would take place in a crop consisting partly of plants silking before tasselling and partly of "apparently barren" plants, which silk much later than they tassel.

Whatever may be the explanation of vigorous stalks being really barren, it is certain that many cases of so-called barrenness ("nubbins" and "blind ears") are due to late development, or to the total failure of the silk to push out of the husk. In the former case the emergence of the silk is so late that there is no pollen available to pollinate it. This happens to a good many of the second and third ears on the stalk of a prolific plant. Retardation of the silking of the main cob may be due to the inherent weakness of the plant, due to weakly germinating or self-fertilised seed, or the condition may be induced by fungus, insect, or other injury. Ants and grubs are responsible for a number of failures in germination, or failure of the young seedlings to reach the surface, and many seedlings which do get through to the surface are so weakened in the attempt that they never recover. Once above ground, the young plants have to contend with cut-worms and aphides, which considerably retard growth. Again, moth-infested or weevily seed is robbed of a large amount of the nutriment on which the young seedling depends, and too deep planting, lack of moisture, or injury due to cultivation, may also retard the growth of individual plants in such a way that more vigorous plants get a better start from which they never seem to look back. When it comes to a question of fighting for supremacy, the more vigorous seedlings literally so crowd the weaker ones out that many barren stalks among the latter are the result. What farmer has not observed how one plant with a start of a day or two maintains its lead and starves its later neighbour out of its proper food supply? Especially is this the case with maize.

Poor methods of cultivation, especially in the early stages of growth, also induce a lot of barrenness in a crop.

It is certain, too, that there is a seasonal as well as a soil influence on barrenness. A late maturing, strong growing variety, which gets a good season in its early growth, is so weakened for reproductive purposes if the latter part of the growing season is unfavourable, that a number of barren stalks result. A large-eared maize produced on rich soil will also harbour many barren stalks if transferred to a poorer soil or to a district of more scanty rainfall.

Another cause of so-called "barren stalks" is the hereditary tendency to produce more than one ear at a single node. In very many of these "barren stalks" at Grafton last season, there was a distinct tendency to produce two or more ears at a node, as many as six being observed, and all barren or "nubbins." This form of prolificacy is not the normal method of production, and should be avoided in selection, where one ear of such a group is worth selecting. Prolificacy appears normally in the form of single ears at different nodes, and discreetly employed is a valuable point of improvement in late maize.

Detasselling.

This brings up a question on which there has been a good deal of controversy, and on which some still exists. I refer to the operation of detasselling alternate rows in a field crop in order to increase the yield. Looked at from

one point of view, what seems to have been aimed at is support to the theory that instead of the plant expending its energy in producing tassel and pollen, this energy might be conserved for increasing the size of the cob and filling out the grain. The results obtained have been very conflicting, but they mostly go to show that the operation does not warrant the labour expended on it, when the commercial aspect is taken into consideration. Rightly so, too, for it seems that the real reason for detasselling has been overlooked.

Everyone knows that cross-fertilised seed is more vigorous than self-fertilised seed in maize, and it seems surprising that detasselling has not been used oftener with the object of producing cross-fertilised seed.

Most of the experiments in detasselling carried out in this State which have been recorded seem to have concerned themselves with the immediate effect on yield, but none seem to have followed up the experiment to see whether seed of detasselled plants is better than seed from plants not detasselled (some of which may be self-fertilised), and whether detasselling is a payable operation from this point of view. This, of course, only requires a small seed plot, not the general field crop, and since the experiment is confined to a small seed plot, it may as wel be carried out so as to give more striking and certain results. Take several ears of a variety and plant the seed from each in separate adjacent rows, keeping the alternate rows detasselled. When the crop is ripe select ears from the detasselled rows, and also some from those not detasselled. Test one lot against the other over a quarter of an acre or more, and the benefit of detasselling will be at once apparent, owing to the fact that seed from the detasselled rows is all, of necessity, cross-fertilised, while seed from the un-detasselled rows is largely self-fertilised or close-fertilised. The latter term means that it is fertilised by pollen from other plants in the same row—the progeny of seed of the same ear—and, therefore, bearing a close relationship to them. The exact relation between two plants in the same row that came from grain of the same ear would be full brother and sister or half-brother and half-sister, for they would both have the same mother, and possibly the same sire. At any rate, the most distant relationship the tassel of one plant in an ear-row plot can bear to the silk of another plant in the same row is half-brother to half-sister, and it is close-fertilisation if union is effected between them. Just as cross-fertilised seed is more vigorous than self-fertilised seed, so close-fertilised seed lies between the two in vigour, but is very little superior, if any, to self-fertilised seed.

Floral Abnormalities and Pollination.

Yet another method of pollination occurs to some little extent in a field crop. It is often noticed that a tassel will bear naked grains either below or above the branches on the main stalk of the tassel. These, of course, are the result of female flowers (silks) on the tassel, a circumstance supposed by some to be an indication of reversion to the original plant from which maize was evolved, and thought to be caused by the weakening of the plant owing to continued self-fertilisation. It is rather significant that more of these abnormalities are seen in a good season or on rich soil; this is explainable

by reason of there being a greater chance of these less vigorous plants developing when such conditions obtain, whereas a less favourable soil or season would check their development, and they would be less apparent, not having the vigour to withstand unfavourable conditions.

These grain-bearing tassels largely occur on suckers, but are sometimes found on the main stalk. In every case which the writer has observed so far, these silks on the tassel are earlier than the tassel itself, and are pollinated before pollen from the same tassel is ripe. So that as far as these naked grains on the tassel are concerned, they are not self-fertilised as might be concluded from the juxtaposition of the tassel, but must always be cross-fertilised. But where self-fertilisation is likely to occur is from these late tasselling suckers to the silk of the main stalk. If the theory is correct as to these abnormalities being the result of self-fertilisation, then stalks with such abnormal flowering suckers should be avoided in field selection.

Such naked grain in the field does not usually last long, as the birds get it at the first opportunity, and what they miss generally attracts the weevil, at least on the North Coast. Some such naked grains were obtained last season from a crop of Improved Yellow Dent, and since, as mentioned before, they are of necessity cross-fertilised, it was thought that the progeny would show some vigour. Such proved to be the case, for very vigorous plants and good normal ears were produced in every instance from the planting of such grain. Being planted on upland soil, however, and fairly close together, the plants did not sucker, so that it was impossible to tell whether such seed would produce the same abnormally flowering suckers, and again increase the chances of self-fertilisation of the ear of the main stalk.

In the work of maize improvement, in order that nothing may be left out of account, it is necessary that even the apparently most insignificant points should be tested and investigated until some definite conclusions can be drawn, for no detail should be left shrouded in mystery and ignorance.

Wind as an Agent of Pollination.

Wind is undoubtedly the chief agent in effecting pollination in maize. The fact of the pollen being produced high up on the plant in stamens which hang out of the glumes, and burst when ripe, and the uncovered silk lower down the plant, readily suggests that maize was intended by Nature to be wind pollinated (anemophilous) rather than insect pollinated (entomophilous).

Data found in America and Africa put from a quarter to a half-mile as the necessary distance between two plots of maize to prevent interpollination. It can easily be conceived that, with the lightness of the pollen grains and the high velocity sometimes attained by the wind, this distance is not too far for a safe working basis for maintaining purity where several varieties are grown.

Bees and Pollination.

It is commonly thought that bees effect a large amount of pollination in maize, and are especially active agents in causing interpollination between two varieties grown some distance apart. Before this can be definitely asserted, it will be necessary to go into the matter with greater scientific

accuracy; conclusions cannot be formed by just seeing a large number of bees busy on the tassels of maize. It is necessary also to closely observe the habits of the bee.

First of all, we may definitely get out of our minds the notion that bees cause direct pollination by collecting pollen about their body and brushing it off against the female stigma, as they do in the case of most other plants they visit. In maize, it must be remembered that they have no occasion to visit the silks when covered with pollen, and it is certain, in the writer's opinion, after watching them at all hours of the day, that they never visit the silks at all.

The question whether there is honey in maize is still a debatable one. Mr. Warry, the Demonstrator in Apiculture to the Department, states that he has seen bees go right into the maize flower when the stamens are hanging outside. The only thing that might attract them there is a pair of small lodicules, akin to small sepals, which become rather fleshy at this stage. Bees may find some sweet sap in these lodicules, but there should be evidence of them being pierced or scratched in some way, and this has never been observed. Apart from the question of pollination, this is a matter which would bear investigation. A biological chemist might find something in the nature of nectar in the succulent stage of the lodicules. A fact which may have some significance in this regard is that in countries like Italy, where maize is grown for sugar, the sugar content in the stem is almost doubled by detasselling.

Returning to the question of pollination, there is little doubt that bees collect large quantities of maize pollen, which has its own peculiar scent, for the purpose of feeding their young larvæ. The method by which the bee collects the pollen is of interest. It will be seen to hover beneath the protruding anthers in an inverted position, and then suddenly dart against them, so that the pollen is collected in a shower on the under surface of the body. The bee then quickly rolls up this pollen into balls, one being carried under each of the third pair of legs. Now any swarm of bees will, it is well known, work out a patch or a field of food supply before leaving it for another, and any bee will find sufficient pollen on a single tassel for one load, and will work out this tassel before proceeding to another if undisturbed.

Therefore, in considering what effect bees have on pollination, it will be seen that the chances of cross-pollination from one crop to another are remote, for even if the bee does actually visit two different crops in one day, the amount of cross-pollination that can possibly occur is limited by the quantity of pollen that will fall from its body, since it never visits the silks. Beside the ball-shaped masses of pollen, which the bee securely holds, a certain amount of loose pollen collects on the body and wings. This would be largely removed in flight, but a certain amount would be likely to adhere to the body until brushed off by the bee rubbing up against something of a slightly sticky nature. The silk, of course, would be ideal for removing this pollen if the bee brushed against it, but it does not. It will be seen that when the matter is considered in some detail, the chances of cross-pollination from one crop to another by bees are very remote indeed.

Now let us consider whether bees affect pollination in any way at all. Firstly, the suggestion that bees rob the tassel of pollen to such an extent as to cause a dearth of supply need not be seriously considered in view of the enormous quantity of pollen produced by a single tassel.

As stated before, the pollen in the anthers has a peculiar habit of hanging together, even though it is fully ripe and the anthers are open, requiring a light breeze to set it free. In the early morning, long before the first breeze stirs the atmosphere, the bees are already at work. By the action of collecting pollen, the tassel of the maize plant is jarred by the bees, and a considerable quantity of pollen is set free. As no breeze has yet arisen, this pollen falls directly downwards, and if the plant has not the provisions against self-pollination previously mentioned (wide leaves and the husk in the same vertical plane as the upper leaves), part of the ear seems doomed to self-fertilisation. At this time of the morning the silk is in a very receptive condition, being usually moist with dew and very favourable for the immediate germination of the pollen grain, for fertilisation is usually very rapid in maize once pollination occurs.

We thus see that the part played by bees in the fertilisation of maize is likely to be injurious rather than beneficial, because of the large amount of self-fertilisation likely to occur. Nevertheless, the breeder may, by observing these points in field selection, avoid the danger of self-fertilisation which is likely to be caused by bees.

Pollination by other Insects.

A small black ant was observed last season at Grafton to visit both tassel and silk in large numbers, and the ubiquitous rose-leaf beetle which feeds on pollen in the tassel and in the silk, and incidentally on the silk itself, must also cause a fair amount of pollination. These insects would be more likely to cause self-pollination from the fact that they visit both the tassel and silk of the same plant successively. In the case of the rose-leaf beetle, the pollination it causes is sometimes prevented from becoming fertilisation because of its voracious feeding on the silk. But in most cases fertilisation takes place so rapidly after pollination that these beetles cannot keep pace with it, and they consequently do little damage, although so abundant

Birds and Pollination.

Birds sometimes visit a tasselling crop in search of earworms or stalk-borers, and they may be able to carry a certain amount of pollen about their body from one crop to another, but this amount would be very small, for most of it would be removed in flight, and what was actually left would not stand much chance of effecting pollination unless the birds brushed up against the silks, and thus removed some of the pollen adhering to the body.

Conclusion.

It will be seen the simple investigation of the manner of pollination of maize provides evidence that constantly emphasises the necessity for field selection. This may be either mass selection or ear-to-row selection. Mass selection has previously been treated as selection from a field crop, the selected ears being bulked together, and the grain mixed for planting. Ear-to-row selection testing will be treated later.

Pasture Grasses.

THEIR CULTIVATION AND MANAGEMENT.

THE above is the title of Farmer's Bulletin, No. 96, which has just been issued by the Department of Agriculture, and can be obtained on application to the Under Secretary and Director.

The subject is of first importance to New South Wales, for over half the annual wealth of the State is produced by the pastoral industries; but, while that is the case, there is hardly any sphere of agronomy in which the possibilities of increasing the production per acre are greater. By the selection of the grasses or plants that will give the maximum amount of feed of the highest nutritive value, it is possible to increase the carrying capacity of the land to such an extent as to appreciably increase the profits. The conditions mentioned—quantity and quality—involve other considerations, however, such as drought resistance, adaptability to soil and climate, season of growth, and so forth, and these so complicate the problem that only knowledge of the grasses, and of their behaviour and value under given conditions, can provide the solution. These are the things that occupy the attention of the author of this publication, Mr. E. Breakwell, B.A., B.Sc., the Agrostologist of the Department.

Of the millions that are annually produced by the pastures of New South Wales, by far the largest amount is represented by wool, which for the most part is produced on native pastures. On many thousands of acres, injudicious methods of stocking have already permitted the best grasses to be eaten out, notwithstanding that by careful management it is possible to prolong their existence, and even to restore depleted areas without the labour of seeding. This bulletin devotes a chapter to the treatment of native pastures, pointing out that in the interior the establishment of cultivated grasses is at present impracticable and uncertain, those grown in other parts of the world being unable to withstand the dry hot summers. Consequently, it is a question of managing the pastures in such a way that the best native grasses never become eaten out, and are allowed regular opportunities of re-seeding and spreading. "If the grasses are not allowed to seed at least once a year, or if any spot or spots are allowed to be completely depastured, and the grasses to be replaced by thistles or other weedy herbage, the land is certainly being overstocked, and few seasons are needed to see the consequences."

The dependence of dairying on an abundant and nutritious pasture cannot be better exemplified than by the history of paspalum on the Northern Rivers, and the need for progressive methods on the South Coast. Considerable space is devoted to indicating the best methods for handling paspalum, and to a discussion of the mixtures likely to be useful in other districts.

These remarks will serve to suggest to all interested in pastoral pursuits the scope of this bulletin, which also touches a number of subjects that cannot be mentioned here. Seventy out of the 103 pages are devoted to references to different grasses, of which over ninety are specifically named, some requiring only incidental mention, while others, like paspalum, occupy up to six pages. All are indexed on a complete system.

A useful feature is a map of the State divided into twenty-two sections, for each of which the most suitable native and introduced grasses are named. The illustrations are numerous and well produced.

Grass Palatability Tests.

HAWKESBURY AGRICULTURAL COLLEGE.

E. BREAKWELL, B.A., B.Sc., Agrostologist.

[It should be noted that the spring of 1914 in the Hawkesbury district was unusually wet, and this factor must be taken into account in considering the palatability of the various grasses.—ED.]

DURING the summer of 1914–15, grass palatability experiments were carried out at Hawkesbury Agricultural College. The experiments were carried out on quarter-acre plots of the following named grasses at a young stage of growth :—

Introduced grasses.—*Paspalum dilatatum*, Rhodes grass (*Chloris gayana*), Hungarian Brome grass (*Bromus inermis*), Texas Blue (*Poa arachnifera*), Perennial Rye (in head), Prairie (just coming into head), and *Eragrostis curvula* var. *valida*.

Native grasses.—Paddock Love grass (*Eragrostis leptostachya*) and Rare Blue grass (*Andropogon intermedius*).

The plots ran in adjoining strips.

Four Jersey cows, well fed, were turned on to the plots in the morning, at about 8 o'clock, and left on till 11 a.m. They were then taken off for a couple of hours, turned on again at 1 p.m., and finally removed a little after 3 p.m. Care was taken to give the cows an opportunity of testing all the grasses. In cases where they appeared to show no preference for the grass, they were compelled to remain for some time on that plot, to ascertain if they would eat the grass on compulsion. The approximate amount of time the cows remained on each plot was noted.

Another experiment was carried out on similar lines in the month of February, at a time when the grasses were in head. In this case a plot of Teff grass (*Eragrostis abyssinica*) had also reached the flowering stage.

The results of the experiments were as follow :—

TABLE showing number of minutes spent on each grass during the first trial.

Grass.	Cow No. 1.	Cow No. 2.	Cow No. 3.	Cow No. 4.	Average.
Prairie	140	155	130	120	136
Paspalum	60	70	70	45	61
Hungarian Brome	45	40	30	50	41
Perennial Rye	15	20	20	20	18

Only about 20 minutes altogether was spent on all the other plots. Rhodes grass and Texas Blue were eaten, but only on compulsion. The two native grasses, *Eragrostis leptostachya* and *Andropogon intermedius* were not eaten, even on compulsion.

TABLE showing number of minutes spent on each grass in the second trial.

Grass.	Cow No. 1.	Cow No. 2.	Cow No. 3.	Cow No. 4.	Average.
Paspalum	160	140	155	130	141
Hungarian Brome ..	50	60	55	65	57
Prairie	20	25	10	25	20
Teff Grass	30	..	40	...	17

All the cows spent nearly an hour on some young summer grass which was growing on a vacant plot.

Rhodes grass was nibbled at, but not appreciated The Prairie was in a very advanced stage. Under no circumstances could the cows be compelled to eat *Eragrostis leptostachya*, *Andropogon intermedius*, or *Eragrostis curvula.*

Conclusions.

The results in this particular experiment were conclusive enough to show that Prairie, Paspalum, and Hungarian Brome were easily the most palatable in the young stages, and Paspalum and Hungarian Brome in the seeding stages. It is to be noted that, contrary to expectations, the Paspalum was eaten very readily, even in its mature stages. In both cases Rhodes grass was only eaten on compulsion.

A remarkable feature of these experiments was the fact that the native grasses were disregarded in favour of the cultivated. This happened at both stages of growth. To confirm these observations bundles of *Andropogon intermedius* were placed among some cattle in the yard, but they again refused to eat it.

The results of the experiments are only suggestive. It does not mean, for example, that the grasses which were refused on the Hawkesbury soils would be refused on the better classes of soils, such as exist on many parts of the coast. Several factors, such as the chemical and physical texture of the soils, climatic conditions, and individual variation among the animals, must be taken into account as affecting the palatability of grasses.

Further Experience with Phalaris bulbosa.

E. BREAKWELL, B.A., B.Sc., Agrostologist.

A GREAT deal has already been written concerning this grass in the *Agricultural Gazette.* The following additional information, however, may be worth recording.

Permanence of the Grass under Stocking.

At Glen Innes Experiment Farm a paddock of this grass has been stocked fairly heavily with sheep for a period of nearly four years. The grass has suffered in no material way from the stocking. The stooling habit has been considerably developed, and the grass now almost completely fills the spaces between the rows in which it was first sown. The leaf retains its characteristic broad and soft form, and the succulence and palatability of the grass are beyond all question.

One of the best examples of the suitability of this grass as pasture was provided last year at Pambula, on the farm of Mr. J. H. Martin. Twenty cows were pastured on an experimental plot of about an acre of this grass, during the critical months of June, July, and August, and although the feed was supplemented by ensilage for the first six weeks, after that period the grass was practically the only feed the cows procured. The paddock at present shows no ill effects from the stocking. Mr. Martin is thoroughly assured that *Phalaris bulbosa* is the best winter grass yet introduced into Pambula district.

Mr. Simpson, of Stonehenge, perhaps the most extensive grower of this grass throughout the State, is still increasing his area.

The experiences above mentioned, together with many others, seem to warrant the recommendation of *Phalaris bulbosa* as a permanent grass for winter pasture on the coast, tablelands, slopes, and irrigation areas of New South Wales.

Drought Resistance.

By this term is not meant the power of the grass to make growth during drought conditions, for this it will not do. It will, however, retain its verdure under moderately dry conditions, and will maintain a vital root-system under extremely dry conditions. The last summer at Glen Innes Experiment Farm was a very dry one, yet no sooner had rain fallen at Easter than the grass quickly sprang into life, and a fortnight after was able to provide its usual amount of flag for pasture.

An even better example of its drought resistance has been provided at Wagga Experiment Farm. Only 10 inches of rain fell in sixteen months, yet, in spite of these almost unprecedented conditions, the majority of the *Phalaris bulbosa* plants are still alive, and quickly show a green shoot after each shower of rain.

Hay Qualities of the Grass.

The hay qualities of the grass are materially assisted by the manner in which the green flag lasts right up to the time of seeding. Even when the seed is mature, the grass is fit for hay purposes, and it can be made to serve a dual purpose, viz., for seed and for hay. The palatability of the hay is of the highest order.

Different Strains.

There appears to be no doubt that *Phalaris bulbosa* displays great variability as regards strain. At Bathurst Experiment Farm it has been fairly conclusively proved that imported seed produces plants far inferior to those from the seed of the *Phalaris bulbosa* which was introduced to the farm several years ago. Whereas the latter grow to a average height of 4 to 5 feet, that from imported seed will not grow nearly as high, and will also die down much more quickly in the summer than the superior strain.

The following report has also been received from Big Swamp, where the difference in strains has been noticed :—

"A little of your seed was sown 21st November, 1914, under ordinary conditions, *i.e.*, after a fire, and the seed germinated about four weeks ago (March, 1915). It now stands 7 to 8 inches high.

"Last autumn I tried a plot of *Phalaris bulbosa* about ¾ of a chain square. Seed (from Sydney) was sown on the 4th April, and it did not germinate for nearly three months, but made rapid growth afterwards.

"It was allowed to come to seed, and when fit, seed was picked off, and the grass cut and made into hay, which was afterwards cut into chaff. The chaff was a nice colour, and much liked by horses. I obtained over 3 cwt. of chaff and 11½ lb. of seed.* The average height of the grass was 5 feet 6 inches high, although some went over 6 feet 6 inches.

"N.B.—The seed used was supposed to be *Phalaris bulbosa*, but it turned out to be a mixture of about equal parts of *P. bulbosa* and *P. commutata*, the difference between the two being that the latter was more abundant in leaves, but not equal to the former in succulence."

Method of Harvesting the Seed.

The seed matures very unevenly, and only a proportion of mature seed can be expected from the seed heads. The best time for harvesting appears to be the stage when portion of the seed head appears to be blown away or broken by the wind.

In the absence of harvesting machinery, a good method appears to be to remove the seed heads by breaking or cutting the stalks. In harvesting the seed on a small scale, the husks are best removed by rubbing the seed heads over a large sieve, then transferring the seeds and chaff, which have fallen through, to a sieve just fine enough to allow the seed to fall through. Winnowing by means of a hat or other similar object will then blow most of the remaining chaff away. About 3 lb. of seed may be thus treated by one person in an hour.

* This was at the rate of 53 cwt. of hay and 204 lb. of seed per acre.

The Prickly Pears of Interest to Australians.

J. H. MAIDEN,
Government Botanist of New South Wales, and Director, Botanic Gardens, Sydney.

No. 13.—A Scone Prickly Pear (*Opuntia sp.*).

Uncertainty of Botanical Name.—This is the second species, acclimatised in Australia, whose botanical name is still uncertain, and until this is settled it is best not to attach a botanical name, even with a query mark. The first species is No. 11 of this series (this *Gazette* for 2nd June, 1914, p. 519). Both species are found in Queensland, and the one now under consideration is also found in Scone, New South Wales, while the other is not, so far as we know. It therefore occurred to me to refer to it as a Scone Prickly Pear to render confusion with No. 11 ("Queensland Prickly Pear A") less likely.

In this course I follow the very good example of Dr. Griffiths, in charge of Prickly Pear observations for the United States Department of Agriculture, who, in his official reports, has, in quite a number of cases, refused to quote a botanical name unless he felt quite certain of his ground.

I have been long engaged in investigations as to the identity of the species introduced into Australia, and wish to make what may appear to be the extraordinary statement that by far the greater part of what has been written by various authors in different countries in regard to Prickly Pear is either of no value or is an actual hindrance to knowledge, simply because one cannot ascertain the species written about. As regards species introduced into Australia, some points cannot be settled in this continent, which is not the original home of any of them. We must collect the evidence, and the few specialists in the genus who have first-hand knowledge will weigh it, and, sooner or later, with the aid of the excellent illustrations now presented, come to a decision. The literature of those particular species will then, and not till then, be unlocked to us.

The Scone Prickly Pear and Queensland Prickly Pear "A" are tall-growing species bearing a profusion of white spines, and they bear a considerable amount of general resemblance when not in flower and fruit, but, when the plates are compared, it will be seen that they are quite distinct.

We will now proceed to a description of the Scone Prickly Pear figured.

Description.—At Scone there is a small patch, say 20 feet in length, of pear 10 feet high and several feet thick, along the fence between Mr. French's house and Bakewell's paddock, near the late Dr. Scott's house. It does not spread rapidly ; I have seen no great change in ten or twelve years.

It has very large joints, say 10 by 12 inches, with abundant white recurved spines in clusters.

Colour of flowers, orange-yellow.

It bears a profusion of fruit (a joint I brought to Sydney has thirty on one side and several on the other). The fruits are barrel-shaped, rich orange in colour, with flesh somewhat darker, and with a purplish cast. They are longitudinally streaky, and not bad eating.

Spicules abundant on the fruit, clusters all over ½ inch apart.

Range.—I know no other New South Wales locality. It occurs at Gracemere, near Rockhampton, Queensland, and also at Westwood, 31 miles from Rockhampton. Its Queensland range requires investigation, as in some places it is intermixed with Queensland Prickly Pear "A," with which it may be confused on a cursory examination.

Affinities.—Some years ago I submitted copies of coloured drawings, together with photographs, to two leading authorities on *Opuntia*, with the following results. I do not quote their names, as their opinions are not final.

No. 1 said :—

This, I suspect, is one of the big "Mansa" or cultivated species of the Mexican Highland. The illustration of yours and notes lead me to suspect that it is very close to, if not identical with, "Nopal Naranjada" of the Mexicans. What it is botanically we do not know in this country (United States), and it seems to me a hopeless task to find out until the literature has been thoroughly gone over and the names either rejected or associated with the plants to which they belong. . . . . There are no less than twenty species of this same general character commonly grown by the poorer people of the highlands of Mexico, and very little is known regarding their botanical names.

We must leave him to prosecute his researches, and it is quite possible that the Opuntia may prove to be undescribed. The reference to "Tuna Naranjada" will be understood by the description of that Opuntia (Orange) given at page 54 of "The Tuna as a food for Man (D. Griffiths and R. D. Hare, Bulletin 64, Exp. Station, N. Mexico, 1907). The Tuna Naranjada has not been botanically determined so far.

No. 2 said :—

This, I think, is *O. Amyclæa* Tenore (DC. iii, 474), a form of or species related to *O. ficus-indica*. It is quite possible that this is *O. maxima* Mill. (*Dict.* ed. 8, No. 5). I saw this plant near Palermo and Taormina, in Sicily. . . . . The fruit and flowers confirm me in my opinion, and so does the photo.

* * * * * * *

O. Amyclæa. Some notes on this species have been already given at No. 6 of this series (January, 1913, p. 51), to which I beg to refer my readers. At A I quote Don, whose description is an English translation of De Candolle's *Prodromus*, iii, 474. De Candolle says, "Perhaps the same as *O. maxima* Salm-Dyck."

Under *O. decumana* Haw., in the same work, *O. maxima* Mill. is given as a synonym without comment. So that *O. Amyclæa* is considered to be "perhaps the same" as *O. decumana.*

O. decumana Haw. was not figured by its author, and, in course of time, different writers have had different views in regard to its identity. Don (*op. cit.*) described it as with—

Joints ovate-oblong; prickles deciduous, length of the wool from which they issue. . . . There are varieties of this plant with either ovate or lanceolate-oblong joints, almost unarmed or furnished with some short white prickles. Flowers, yellow. . .

A Scone Prickly Pear (*Opuntia sp.*).
Hedge of the Plant growing at Scone

No. 12. A SCRUB PRICKLY PEAR.

(Opuntia sp.)

This incomplete description would tally, so far, with that usually applied to *O. ficus-indica*, as figured and described by me in No. 6 of this series. *O. ficus-indica*, as usually understood, varies in number (never very many or formidable) of spines, colour of exterior of fruit and of its flesh, and colour of flowers. What particular one of the many forms of *O. ficus-indica* is represented by *O. decumana* does not appear to be known.

The description of *O. maxima* Mill. is given in Don as—

Plant erect; joints ovate-oblong, very thick; spines unequal. Perhaps the same as *O. Amyclœa.*

This is evidently a spinous plant, and it is very possible that *O. Amyclœa* and *O. maxima* may be synonyms.

As Authority No. 2, quoted by me, says, it is probable that the Scone Prickly Pear now figured is *O. Amyclœa* (which possibly is synonymous with *O. maxima*), I submit this view, but will not label the plant as *O. Amyclœa* without further investigation. The spines of the Scone pear are more formidable than those I have associated with *O. Amyclœa*, but I speak with deference. Although there is abundant evidence of the affinity of *O. Amyclœa* and *O. ficus-indica*, I think they should be kept under distinct names, the former being distinguished by its profusion of white spines.

Messrs. Johnston and Tryon, who formed the Queensland Travelling Commission of Investigation in Prickly Pear, refer to this Scone pear in the following passages taken from their official report:—

A. Another white-spined Opuntia occurs near Rockhampton, where it is called the "yellow-fruiting Mexican pear." This species, which is of Mexican origin (its origin is surmise, so far as I know.—J.H.M.), is very like the spiny pest pear of South Africa, and resembles the spiny Barbary fig or Indian fig (*O. Amyclœa*) of the Mediterranean coasts. (Report VIII.)

B. *O. decumana*, the Pest Pear of South Africa. Of the latter there are two forms, the spiny and the comparatively spineless. . . . . The name *O. decumana* is used in this section with a considerable degree of doubt. The South African doornblad (smooth) and kaalblad (prickly) belong to the same group of species as *O. ficus-indica*, *O. decumana*, and the red and yellow Mexican species of our Rockhampton district. . . . . The term *O. decumana* should probably be restricted . . . . to certain almost or quite spineless forms possessing very large segments. . . . The common South African species, kaalblad and doornblad, are, however, quite distinct from the *O. ficus indica* of the Mediterranean littoral. (Report, p. 29.)

C. *O. ficus-indica.* The Westwood (No. 11 of this series.—J.H.M.) and particularly the Yellow Mexican (No. 13, the present species.—J.H. M.) Prickly Pears of Queensland are related to this species. (Report, p. 105.)

The common Barbary Fig, *O. ficus-indica* . . . . The scientific name commonly applied to it is *O. decumana.* . . . . . (p. 47).

It is almost spineless, and resembles the Kaalblad (? *O. decumana* Haw.) of South Africa in many ways. An obvious difference is in the form of the joints. . . . . . Then again, the flowers of the Barbary Fig are generally yellow, orange-coloured flowers being the exception, whereas in the Kaalblad the reverse is the case. (ib.)

I am not quite clear as to what are Messrs. Johnston and Tryon's conceptions of *O. decumana* or *O. Amyclœa.* The position is, of course, very difficult.

I have already stated that I look upon *O. decumana* as an indeterminate synonym of *O. ficus-indica.*

I. H. Burkill (Determinations of the Prickly Pears now wild in India, *Rec. Bot. Survey of India,* vol. 4, No. 6, p. 288) says the same thing in different words :—

The *O. ficus-indica* of the writers on the Mediterranean flora is a plant 8-12 feet high. with very short deciduous thorns hardly longer than the glochidia, with yellow flowers, producing in its garden races fruits—

1. Blood-red. 2. Yellow. 3. White. 4. Seedless.

All these writers evidently refer to the edible *O. decumana* now commonly cultivated in the Riviera, in Italy, Sicily, Malta, and elsewhere.

Although (No. 6 of these series) I have depicted *O. ficus-indica* with orange flesh and yellow flowers with orange bases to the petals, it is necessary to observe (as emphasised in the text) that there is much variation in the species in this respect.

Summary of Statements.—

1. *O. Amyclæa* may be *O. maxima* Mill.

2. *O. decumana* Haw. is *O. maxima* Haw.

3. So that *O. Amyclæa* may be *O. decumana* Haw.

From correlation of evidence adduced, it would appear that explanations of the above statements, which appear contradictory on the surface, are as follows :—

4. All the so-called species are closely allied, and have been placed in one by some writers.

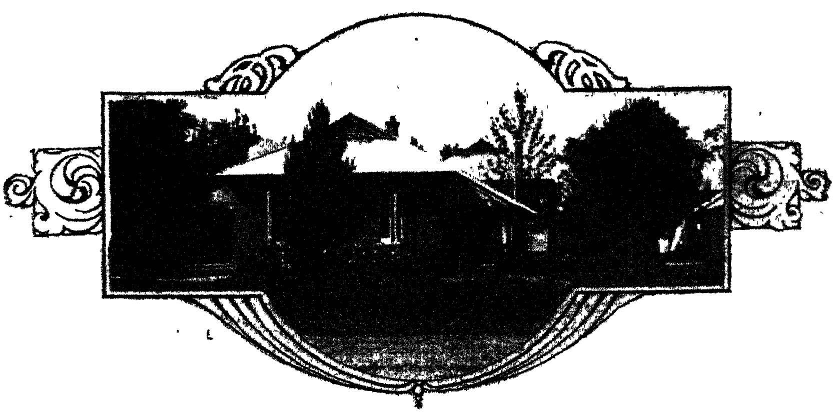
5. *O. ficus-indica* is a smooth and somewhat variable species, which includes *O. decumana.*

6. *O. Amyclæa* is a white-spined species, which may represent the Scone Prickly Pear now figured, but

7. It may be a new species allied to the "Nopal Naranjada" of Mexico.

Coloured Plate.—This is self-explanatory.

Photographic Illustration.—Hedge of the plant growing at Scone.



B

Fungicide Experiments, 1914.

G. P. DARNELL-SMITH, B.Sc., F.I.C., F.C.S., Biologist.

DURING 1914 the Department carried out a further series of experiments to determine the most suitable fungicide to apply to wheat seed to prevent infection with bunt. As has been pointed out before, the merits of a fungicide must be judged in this connection—(1) by the greatness of the number of seeds that germinate after treatment, and (2) by the smallness of the number of plants that show infection after treatment.

Unfortunately, at both Cowra and Wagga, where the experiments were carried out, the season was so unfavourable that the results of the field trials have to be taken with a certain amount of reserve; the germination was bad owing to untoward conditions; and of those plants that did germinate, some perished before reaching maturity.

Some experiments on germination, however, that were carried out in nursery-boxes at Cowra show remarkable consistency. They are given below:—

GERMINATION RESULTS. Variety—Federation. Nursery Box Section. Watered when necessary.

Box No.	Treatment.	No. of Seeds sown.	No. of Plants that germinated.
1	½ per cent. bluestone and limewater	50	45
2	½ per cent. bluestone, no limewater	50	43
3	1 per cent. bluestone and limewater	50	50
4	1 per cent. bluestone, no limewater	50	47
5	1½ per cent. bluestone and limewater	50	45
6	1½ per cent. bluestone, no limewater	50	41
7	2 per cent. bluestone and limewater	50	46
8	2 per cent. bluestone, no limewater	50	36

In each case the seed was kept in the bluestone solution for three minutes. Where wheat seed is dipped only in bluestone before planting, germination may be satisfactory if the conditions are favourable; but, if the conditions are unfavourable, the germination may be unsatisfactory unless the dipping in bluestone is followed by a dipping in limewater.

Even in the above experiment, where the conditions were the most favourable for germination, bluestone followed by limewater shows an advantage in every case.

Dipping wheat seed for three minutes in a 1½ per cent. solution of bluestone, followed by a dipping for three minutes in limewater, has, up to the present, been found the most effective "pickle" as regards preservation of germinating capacity and prevention of bunt infection.

The 1914 season at Wagga was the worst ever recorded in the district. The total rainfall from sowing to harvest was only 3·45 inches, and probably on this account the results of the field trials, as given in the following table, were somewhat inconsistent. The number of growing plants was determined on 10th August, and the observation as to bunt infection was made on 10th and 15th October. In nearly every row odd plants were missing, having been either broken down, uprooted, or destroyed by birds, &c.:—

FUNGICIDE EXPERIMENT, Wagga Experiment Farm, 1914.

Treatment	Variety—Bunyip.			Variety—Comeback		
	No. of Grains germinated	Bunty Plants	Clean Plants.	No. of Grains germinated.	Bunty Plants	Clean Plants.
Bluestone, ½ per cent., and limewater ...	89	1	88	80	5	75
Bluestone, ½ per cent., no limewater ...	80	1	77	83	10	71
Bluestone, 1 per cent., and limewater ..	75	0	75	84	0	81
Bluestone, 1 per cent., no limewater ...	57	0	57	81	0	80
Bluestone, 1½ per cent., and limewater ...	72	0	70	65	3	61
Bluestone, 1½ per cent., no limewater ...	66	0	65	69	1	67
Bluestone, 2 per cent., and limewater ...	70	0	68	76	1	72
Bluestone, 2 per cent., no limewater ...	73	0	67	68	1	65

The number of seeds planted in each case was 100, and the time of immersion in bluestone and in limewater three minutes.

RE-SOWING WHEAT AFTER A GERMINATION.

A FARMER in the Riverina wrote to the Department recently asking whether he should re-sow 200 acres of stubble land that had been previously sown with Federation. The seed-bed was dry, but about two weeks after sowing there was a fall of 30 points of rain, and upon examination it was found that the seed had germinated, and had developed a root about a quarter of an inch long, which later had shrivelled up though it was not dead, and would grow again if further rain came.

Mr. H. Ross, Chief Inspector, stated in reply, that when wheat had germinated under conditions such as those indicated, it frequently happened that the seed revived, provided good rain fell within a fortnight, but the vitality of the plants was always more or less impaired, and a really good crop could not be expected if the rain was long delayed. If rain did not fall within the time mentioned, it would be found that more than half the young plants would be dead. As in the writer's case, the interval between germination and the date of writing was eight days, it would be better to re-sow the paddock.

Reminders for Potato Growers.

A. J. PINN, Inspector of Agriculture.

COASTAL farmers are reminded that the shortage caused by the failure this year of the crop in the tableland districts, and the probable early exhaustion of the Tasmanian supply, are likely to cause a very strong demand and high prices for crops harvested early from the coming spring planting. It is, therefore, well worth while to take every step that will hasten the development of the tubers, and enable them to be put on the market at an early stage.

Preparations in Coastal Districts.

In the far North Coast districts the first main planting will take place late this month, and during the following weeks in districts further south, though the largest area will be planted during July and August. All land intended for the purpose, therefore, should be prepared immediately, so that it may get the full benefit of the weathering action of the winter. The land will then be capable of absorbing a large proportion of the winter rains, and if properly cared for will be in a fit state for planting in early spring, quite independently of whether rain falls then or not.

The present ploughing should be deep, and all weeds and crop residues should be ploughed under, not burnt. Their decay in the soil will improve its physical condition and increase its capacity to hold moisture—both things that are essential to the successful production of the crop.

Taking into consideration the result of last season's experiments on the Coast, the varieties recommended are Manhattan, Up-to-Date, and Satisfaction. Another variety that is new to this State, but that is promising well, is Early Manistee—a smooth red-skin that somewhat resembles Early Rose. The supply of seed of Early Manistee in New South Wales is very limited, but it may be possible to obtain some from Victoria, where it is well thought of.

Owing to the droughty conditions of the past season and the depredations of the potato moth grub in the Tableland crops, it will be a difficult matter to obtain sufficient seed of the varieties recommended, and practically an impossibility to obtain supplies of any quantity free from the attacks of the grub. Growers are, therefore, advised to obtain their seed supplies early.

An examination of potatoes that have been attacked will show that practically all the grubs will have left the tubers, and it is not necessary then to discard them as unfit for seed if they still have a number of eyes undamaged. If, however, grubs are still present in the seed, it is advisable to immerse the lot in water for twenty-four hours, and then spread it out to dry.

Shooting the Seed.

Quicker growth and an earlier harvest will be obtained if the seed is well shot before being planted, and in order to do this properly it should be spread out thinly in an airy and fairly well-lighted situation.

The practice of shooting the seed has many advantages, especially where earliness is required. If properly handled the shoots should be short in length and able to withstand a reasonable amount of handling without breaking off. Seed of low vitality, indicated by thready shoots, should be thrown out.

A better stand is obtained by cutting the sets after they have shot, than by planting sets which show no signs of sprouting.

Planting and Manuring.

As crops that are planted very close are likely to suffer from the effects of the hot weather just before the harvesting, planting closer than 30 inches between the rows and 15 inches in the rows cannot be recommended. If the soil is not retentive of moisture the rows should be 3 feet apart. The best depth to plant is about 4 inches.

As early maturity is an important factor in this crop, all possible means for hastening development should be availed of. The application of 2 or 3 cwt. of superphosphate per acre is recommended. The manure should be placed in the drills close to the seed.

Potash should be used for potatoes in conjunction with superphosphate, but the war has interrupted supplies of sulphate of potash, and for the present it will probably have to be omitted.

The Tableland Districts.

Although the planting season in the Tableland districts is a considerable way off, it is worth while just now to point out that the most successful farmer is he who looks well ahead. The early and deep ploughing of the land influences the yield and the profits to a very appreciable extent, ensuring a good supply of moisture and allowing of a couple or three months' weathering.

Last season's crop was practically a failure, owing to droughty conditions, and all varieties suffered more or less. Early planted crops gave the best returns, whereas in the two previous years it was the late crops that proved most productive. Taking the experience of past seasons as a guide, it is apparent that it is wiser to plant both an early and a late crop, than to depend on one main planting.

The early crop, if it could be relied on, would be the better, as it allows of the tubers being harvested when the soil is in good working order, and thus ensures that they are dug and bagged with less soil adhering to them, and at the same time it permits of the land being planted to a hay crop in good time. The late harvested crops, on the other hand, have usually to be dug when the soil is wet and sticky, and more liable to be lifted and bagged with the crop, and if a hay crop is to be planted, the sowing has inevitably to be late.

On the whole, it is well, however, to distribute the risks of the season by planting two main crops—one early and the other late—rather than the whole area at one time.

Varieties for the Tablelands.

The varieties recommended are Manhattan, Queen of the Valley, Up-to-Date, and Surprise. Coronation, which has been a heavy yielder for many years, is not now recommended, having proved to be liable to second growth, and also presenting a darkened vascular system when cut, which detrimentally affects the market value.

In New England, where the season is more certain than in other parts of the State, and wherever the soil is of a peaty nature, thus ensuring a constant supply of moisture, Coronation is very suitable; but on our upland soils, where dry periods are often experienced, it must be considered inferior to such varieties as Manhattan and Queen of the Valley.

Late Sowings of Wheat.

Numerous inquiries have been addressed to the Department lately on the subject of late sowings of wheat, the season having delayed the operations of many farmers.

The Chief Inspector's advice in such cases is that, providing the right varieties are used, wheat can be sown with safety up to the middle of July. As a matter of fact, he has seen a crop that was sown in August yield over 20 bushels per acre, but an early-maturing variety was used. Had the farmer sown a slow-growing wheat like the old purple straw varieties or Rymer, there would certainly have been failure, but the quick-maturing habit of the variety selected—Bunyip—enabled a profitable crop to be harvested.

Several varieties occur in the Department's list that would suit the purpose. As dual-purpose wheats, Bobs, Comeback, Firbank, and Florence are all early in their habit, but Bobs is not a heavy yielder, and seed of Firbank and Florence is always hard to obtain. Comeback is, therefore, the most convenient where the farmer desires the alternative of hay should the season prove unfavourable for grain.

As a grain variety only, Bunyip is the single early-maturing one that can be recommended. It does not make desirable hay, but its early habit marks it out as the best wheat available for any farmer who already has a fair area of good hay wheats, but who has, perhaps, failed to get all his Federation in as early as he would have liked. Sown at any time after the middle of June, the chances are in favour of it yielding better than Federation sown at the same time.

The sowings must be fairly heavy, 65 lb. of Comeback and 60 lb. of Bunyip, and should be accompanied with an application of superphosphate.

Mushroom Culture.

A. J. PINN, Inspector of Agriculture.

FOR the successful culture of mushrooms it is essential that the crop be grown either in very rich "made" soil or in a prepared manure bed, and in a temperature that does not exceed 86 degrees Fahr. and does not fall below 50 degrees Fahr. The second condition is obtained by making use of cellars, disused tunnels, old houses, &c.

Having obtained a suitable place, the bed must be prepared, its chief constituent being good horse manure that is fairly free from long straw. Two mediums are employed—(*a*) a mixture of earth and manure, (*b*) horse manure with no earth.

Where earth and manure are used, it is quite usual to mix a fourth or fifth part of good soil with manure fresh from the stable. The process of fermentation is then slower, and the heat more constant.

When manure only is used, the bed must be properly prepared, as stable manure ferments quickly and produces a degree of heat that is unsuitable for the purpose. The method usually employed is to mix the manure thoroughly, so as to make it of even character throughout, place it in square heaps about 3 feet high, and then beat or tread it down well. If it is a little dry it should be moistened somewhat, and then left to ferment until the heat has increased to such an extent that portions of the manure in the centre begin to turn white, which usually occurs in about a week. It is then necessary to break the heaps up and remake them as before, care being taken to place the material that has been on the outside of the first heap in the centre of the second one, and so on. Within a few days fermentation will again have increased so much that it will be necessary to remake the heaps a second time. In a few days the manure will have become a brown colour, and somewhat greasy. It will be found that, in order to obtain the necessary consistency, the heaps must not be of less size than a cubic yard.

When in the required condition, the manure should be made into beds about 2 feet high and with a base of 2 feet, and should have a flat surface, or, if made against a wall, it may slope from the wall to the floor. Beds are sometimes made in old tubs or half-casks. The beds should be firmed, and allowed to remain a few days in that condition before spawning.

The correct time for spawning is when the temperature is about 78 degrees Fahr., and this must be determined by taking the temperature.

The spawn is sold in brick form by leading seedsmen. For some days before spawning, the brick should be kept in a moderately warm, moist place,

so as to stimulate the mycelium of the fungus. The bricks are sometimes moistened on each side and spread out between a couple of beds. Before use, the spawn should be broken up into pieces about 6 or 7 inches long, 2 inches wide, and 1 inch thick. Each piece is then inserted lengthwise in the bed and flush with the surface, openings having been made with the hands at distances of about a foot apart each way. Usually in beds 20 to 24 inches there are two rows, the pieces in one row being opposite the spaces in the other. The manure must be carefully pressed round each piece, so that it is covered to a depth of about 1 inch.

If the conditions are satisfactory, the spawn should commence to grow in about seven or eight days. At the end of that time, any pieces that have not commenced to produce white threads connecting with the surrounding manure should be replaced by fresh ones. In a fortnight or three weeks after spawning, the spawn should have spread throughout the bed, and should begin to show itself at the surface. At this stage the pieces of spawn should be withdrawn, or they will become mouldy and soil the mushrooms in their immediate vicinity. The empty openings should be carefully closed by pressing down the surrounding soil or manure. The top and sides of the bed should then be covered with a layer of about half an inch of light loamy soil, in a fairly moist condition and lightly pressed down. When the surface becomes dry, light waterings should be given.

Within a few weeks of the last operation, the mushrooms should appear, and should continue to yield for two or three months. The watering of the bed is usually done with liquid manure, or water containing some nitrogenous fertiliser, such as nitrate of soda. The temperature of the liquid should be between 70 and 86 degrees Fahr.

Beds made in open places that are exposed to changes of temperature need to be covered with straw.

The Tweed-Richmond Herd-testing Council.

Results for Year ending 28th February, 1915.

The accompanying table, supplied by Mr. A. W. Hinwood, the Secretary, summarises the results of the Council for the year mentioned. The season for production throughout the district was particularly good. Testing is done for each member regularly once a month. Owing to the fact that the Alstonville and Goolmangar Associations had completed only six months' operations within the period mentioned, the results are not given here.

The Tweed-Richmond Herd-testing Council.

Annual Statistics of the Herd-testing Associations affiliated with the above for the Year ended 28th February, 1915.

Particulars.	Name of Association							
	Bangalow.	Burringbar.	Byron Bay.	Condong.	Corndale.	Mullumbimby	The Channon	Uki.
No. of members at end of year	45	22	18	20	23	20	23	19
No. of cows tested during the year	2,947	1,499	1,359	1,382	1,680	1,692	1,844	1,495
Amount of fee paid per cow	2s.	2s.	2s.	2s.	2s	2s.	2s.	2s. 6d.
Greatest No. of cows tested by any one member	163	183	167	139	126	173	108	183
Least ,, ,, ,,	33	32	29	30	32	29	30	36
Yield of butter by best cow for the year... lb.	720	525·9	483·3	505·8	530·7	431·7	469·8	414·6
,, ,, worst ,, ... ,,	82·8	80·1	50 7	76·5	75·3	82·2	70·2	54·3
,, ,, 100 best cows for the year ,, (average).	374·97	349·68	362·09	357·37	390·79	326·35	328 49	302·71
Yield of butter by 100 worst cows for the year ,, (average).	143·31	118·93	159·27	110·14	147·13	129·66	126·59	116·05
Yield of milk by best cow for the year ... ,,	14,760·	8,065·	8,775·	7,755·	7,275·	6,150·	7,875·	7,485·
,, ,, worst ,, ... ,,	1,785·	1,595·	975·	1,515·	1,455·	1,920·	1,410·	1,230·
,, ,, 100 best cows for the year ,, (average).	7,355·15	6,183 95	7,253·65	6.725·1	7,104·25	5,723·15	6,307·9	5,748·8
Yield of milk by 100 worst cows for the year ,, (average).	3,081·5	2,510 9	3,424·25	1,736·95	3,027·6	2,691·7	2,547·95	2,349·45
Breed of best butter cow	Illawarra Shorthorn.	Grade Shorthorn.	Grade Shorthorn.	Jersey-Durham Cross.	Jersey ..	Jersey ...	Holstein-Jersey Cross.	Grade Shorthorn.
,, cow giving greatest quantity of milk ...	,,	,,	,,	Grade Holstein.	M. Shorthorn.	Grade Shorthorn.	M. Shorthorn.	,,
Weight of milk given ... ... lb.	14,76	8,715	10,815	9,675	9,345	8,325	8,490	8,025

The Future of Dairying.

With Special Reference to Irrigated Areas.

M. A. O'CALLAGHAN.

What the action of the present European war on the world's dairying industry will be it is not possible to say with any degree of certainty. That the war will affect the industry for some time at least there is no possible doubt. As to what extent it will affect it in Australia, or from an Australian standpoint, we can only surmise. Of one fact we may feel pretty confident, viz., that the consumption of cheese in England, and probably in Europe generally, will be greater, both during the war and for some time after it, than it was before the struggle commenced.

The Prospects for Cheese.

A study of the cheese consumption of Great Britain goes to show that increased prosperity did not lead to an increase in the consumption of cheese in the same way that it led to an increase in that of butter. On the other hand, the consumption of cheese per head became somewhat reduced. As a matter of fact, cheese imports into England declined steadily for the ten years ending 1913 from 135,777 tons in 1904 to 117,296 tons in the latter year. The assumption is that as the workers of England became better off owing to increased wages, they ate more meat and less cheese. More butter was also consumed. Owing to the extreme price of meat throughout Europe at present, a tremendous wastage of breeding cattle is going on, and consequently we must look to high prices for meat for some years to come. This should have the effect of an increased consumption of cheese, as this is the only article of diet which can take the place of lean meat. That the value of cheese as a food is being recognised is shown by the fact that during the winter 3 oz. of cheese per day were being served to a million soldiers, representing England and its Allies.

Canadian supplies of cheese to England have also fallen off to a considerable extent, this shortage being made good by New Zealand, where cheese-making has grown in favour at the expense of butter-making. From the cheese-making point of view, therefore, we may reasonably assume that the outlook is a good one, as anything which we produce in Australia over and above our own requirements should meet with a ready market in Great Britain.

The Butter Position.

We now come to a much more important and more difficult problem, viz., that of forecasting the future of butter industry. It was owing to a European war that margarine was first produced, and the indications to-day

are that the present war will draw great attention to margarine as a food. The extremely high prices for butter which have prevailed in Great Britain for several months, together with the depression prevailing in certain lines of industry, must compel the use of margarine in many families where it was hitherto unknown, and those who are conversant with the high quality of the best brands of margarine will readily realise that if the consumer becomes accustomed to the use of this margarine at 6d. per lb. he will not, unless his financial position is in an extremely satisfactory condition, have recourse, in any quantity, to the use of butter at, say, 1s. 6d. per lb.

Again, the tremendous shortage of cattle which will exist throughout Europe at the finish of this war will mean a greatly decreased production of butter, and whereas this should lead to high butter prices, still the financial position of a great majority of the people of Europe will be such that first-class butter will probably be deemed a luxury. Consequently that rise in price which one might expect, owing to a decreased production, cannot be looked forward to.

So much for the aspect of our export trade. We will now consider the position locally. High prices prevailing for beef, together with the drought which has temporarily crippled the industry in Victoria, must bring about a reduction in the number of dairy cattle in Australia, consequently we cannot look for an increased production in the near future. Very satisfactory prices have been experienced during the summer months, and now, with the advent of winter, prices have gone to an extreme level in Melbourne, Queensland, South Australia, and Western Australia. Australia is not making enough butter at the present time for its own requirements, and hence these extreme rates. One disadvantage of extreme prices is the danger of giving margarine a standing which it does not now possess in Australia. Luckily for the butter manufacturer, coloured margarine is allowed to be sold only in one State in Australia, while it is also to the advantage of the butter-maker at present that the margarine manufacturers of Australia have not been able to reach anything like the high standard of manufacture which attains in England and Holland to-day. Provided the regulations in the various States governing the manufacture and sale of margarine are not altered, we have no reason to expect lower prices for dairy produce than that which was experienced during the year ended 30th June, 1914, just prior to the outbreak of war. Though none of the large butter exporting countries have so far been seriously affected by war (if we exclude Siberia), we can hardly look for the same volume of export to England owing to the shortage which will exist in France and Germany, consequently the position, both at Home and abroad, must be considered to be sound.

Better Prices for Cattle and Pigs.

The increased value of cattle, as well as the strong prices prevailing for bacon, are material factors in the welfare of the dairy-farmer. Cows that a couple of years ago, when culled from the dairy, would be worth only about £3 10s. to £4 are now worth at least £7, whereas the value of yearlings has

practically doubled, consequently the income of the dairy-farmer from these sources has greatly increased. While we do not expect that the value of cows of good condition will keep up to the present very high level still we must expect good prices for young cattle, both steers and heifers, for many years, owing to the high price prevailing for beef throughout the world. In fact, veal has become so valuable that some dairy-farmers regard it as a very important section of the industry. In some districts, such as Tamworth and Yanco, there are great facilities in this direction, because by the aid of lucerne the farmer can produce veal without utilising all new milk as calf food.

As stated already, the outlook for a good price for bacon for some time to come is very satisfactory, and as the production of bacon is practically a part of dairy-farming, so the outlook for the dairy-farmer improves with the improved position in connection with the pig industry. Looking at the industry, therefore, from every view-point, there is every prospect that after this world conflict is ended the dairying industry will have stood the clash of arms better than most others. We have no reason at present to believe that the decrease in the purchasing power of the people after the war will be greater, proportionately, than the decrease in the manufacture of butter.

The Outlook on the Murrumbidgee Irrigation Areas.

The extreme drought which has prevailed throughout the greater part of Victoria and South Australia, and throughout the whole of the Riverina, has given a temporary set-back to dairy-farming on the Murrumbidgee Irrigation Areas. There are two reasons for this result, first, the extremely high prices which station owners and wheat farmers have offered and paid for the agistment of sheep and horses have tempted a number of farmers to endeavour to "get rich quick," consequently they have in many cases disposed of their cattle. The second factor which brought about decrease in dairying is the inability to feed an animal anywhere at the present time except on the irrigated lands, therefore the young stock and dry cows that even in summer time would be kept on the non-irrigable lands, have had to be either sent away or fattened and sold to the butcher. In addition, so far, the prospect for grass this autumn is not a good one, and this means that every ounce of food which the dairy cow has consumed and will consume for some time is to be artificially grown and hand-fed to the cattle, and notwithstanding the good prices that have been obtained from butter, they have not been sufficiently high to pay for this increased cost due to increased labour. This, however, is but a temporary aspect, and I have every confidence that dairying will progress on a return to normal conditions. The keenest observations of the results produced on the old Settlement Irrigation Areas in Victoria, all go to show that no form of farming, other than fruit in certain favoured places, has returned the same results on irrigated land as dairying. The State of Victoria depends very largely for the income of its farmers on the dairying industry, and if we could take the present season as an indication, the dairying industry in Victoria would quickly come to an end. I have noticed a report in a recent paper which goes to show that a farmer who paid

£83 an acre for land in Victoria has had his cattle die this year for want of fodder owing to the drought. To judge, therefore, all the possibilities of dairy-farming on the Murrumbidgee Irrigation Areas by this season's results would be to base conclusions on a set of conditions which may never prevail again. I anticipate that when the estate at present occupied by Sir Samuel McCaughey is taken over by the Irrigation Commission, we will see a very great development in dairy-farming in the neighbourhood of Yanco, as undoubtedly the river frontage country, with a high percentage of alluvial or semi-alluvial land, will form even better country for dairying than any which has yet been thrown open for settlement on the Irrigation Areas.

Quality of Dairy Products.

When first writing on this subject, in February, 1915, I stated that I would expect a high quality of butter to be produced on the Areas. It is pleasing to be able to report that this estimate has been very fully borne out. Not only do the local traders, who have had experience of the article produced, prefer it to any other, but the Leeton Butter Factory, notwithstanding the adverse conditions prevailing, has, at the last Royal Agricultural Show in Sydney, obtained premier honours for pasteurised butter. Experiments have also shown that the quality of the cheese which can be produced on the Areas is first-class. As going to show the character of dairy stock that may be raised on the lucerne areas, it might be interesting to point out that a fourteen-months-old Guernsey bull, which was exhibited by the Dairy Demonstration Farm, obtained first prize, defeating two imported bulls.

Cream Quality.

The Necessity for Improvement.

F. WIGAN, Dairy Instructor.

During the summer season just past the dairying industry in the Hunter and Williams Rivers district has enjoyed a phenomenally good time, and there is hardly a factory which has not exceeded by a considerable quantity its previous highest record in the amount of butter manufactured. This, together with good prices during the whole period, must have given great encouragement to dairy farmers generally. It is to be hoped that it will also create fresh interest, and cause dairymen to give more attention to the fine points of their business, and to the employment of thorough and up-to-date methods in the matter of feeding and testing their cows, and the care and handling of their products. They may be confident that in doing so they will make dairy farming a sounder and more profitable occupation.

On the whole, however, the quality of the cream supplies during this period has been, to say the least, somewhat unsatisfactory, and in this most vital matter a vast improvement is urgently needed; in fact (to use a common

expression), one might say that the industry is standing on very thin ice when this matter of quality is thoroughly investigated. The number of boxes of second-grade butter, the low-grade points, and the remarks of the grader in Sydney on some of these boxes, must convince even the most optimistic of the truth of that statement. When examining the creams arriving at the factories it has been alarming to see such a very high percentage of the creams (sometimes over 50 per cent.), which should be classed as second and third quality, with a few even unfit for use.

Cause of Inferior Quality.

Naturally one will ask the reason for this very large number of low quality creams, and most unsatisfactory state of affairs. The answer is well known, and can be given by any qualified factory grader, for practically all of these inferior creams have become contaminated during their handling from the cow to the cream-cans by some unclean conditions that have favoured development of germ life, and a change of fermentation has been brought about by the micro-organisms so introduced.

Farmer's Responsibility.

Where the farmer keeps his cream on the farm for any length of time, say over twenty-four hours in the summer (and most of them do this), he determines by his methods of handling and control just what the quality of the resultant butter will be, and to the trained grader at the factory the cream gives a very accurate account of its past life. If the factories could get daily deliveries of cream (unfortunately this is not workable in some districts) they would, no doubt, make first-class butter from most of it, but their present position is that of being manufacturers of an article from raw materials supplied in many and varied qualities and conditions. The employment of an expert at the factories to classify the creams into grades or qualities has been the consequence of that fact. It is, therefore, urgently necessary that the farmers should acquaint themselves fully with the nature of the article they are handling, so as to be able to deliver a uniformly sound article to the factories. There are still many farmers who do not know what cream is composed of, or even why milk coagulates, and these have so much to learn that they are much handicapped in their business. It is this matter of teaching the farmers more about their work which is urgently required, and too few avail themselves of a chat with the local Instructor, who is at all times anxious to assist them.

The farmers too frequently are apt to blame circumstances, such as the journey on the van to the factory, the hot weather, a "fresh" in the grass, &c., as the chief causes of the second quality; but if such were the case all the creams on each load would be second class. As a matter of fact, such conditions are only aids to the development of bad quality, inasmuch as warm temperatures are essential to the rapid growth and multiplication of germs which have been introduced by unclean, careless, or slipshod methods, or, in some cases, through ignorance of possible sources of contamination. It will be easily understood that cream contaminated by large

numbers of germs during its gathering, and held on the farm for a week in hot weather without an effort at control of temperature can become decomposed and quite unfit for use.

Contamination by the introduction of germ life then. is the main and serious cause of inferior quality in the creams, and indifferent treatment and warm temperatures, together with exposure to similar conditions on long van or train journeys, develop this germ life already present.

Chief Sources of Contamination.

Undoubtedly the chief and prime source of contamination is the separator, and to that now must be added the milking machine, for at least 90 per cent. of those examined by the writer have been found unclean. Then comes unclean cow-yards, dirty hands of milkers, careless milking methods, and in dry times in some districts, the bad and often contaminated water supply on the farm.

I do not intend to deal fully with this matter in this article, but will leave for future consideration the sources of contamination and means of prevention.

Grading or Determining Quality at Factories.

This brief outline of how cream quality is determined is not for the student but for the farmer, merely to give him some idea of what vast changes can take place in his cream, and how its quality is determined.

We will leave the matter of taints due to feed, physical causes, absorption, &c., out of this discussion, for their origin is usually not hard to detect, and they are not so very damaging. Only in very bad cases, such for instance, as those caused by carrot weed, are they sufficient to compel the cream to be classed as second quality.

Now the grader has not to class a cream because it is unpleasant to the smell or taste according to his particular like or dislike, but he should know from an examination of the cream just in what way it does not comply with the fresh, sound, clean, first-class article; that is to say, he must be able to say in what particular it is changed or differs from its pure and uncontaminated state. In much the same way a doctor examines his patient, and diagnoses the complaint from the symptoms displayed in the parts affected, and as a bruise in the muscle manifests itself differently to a break of a bone, so also will a change in the milk sugar be indicated quite differently to a decomposition of the albumen. Further, whereas the change in the sugar might be beneficial, the change in the albumen is decidedly bad, and as both conditions are hastened by warm temperatures, it can be known by the grader that it is the particular kind of germ present which makes all the difference, since different germs attack or change different portions of the cream, or various germs may attack the same constituent in different ways. In their work of attacking, or, as it were, feeding on the particular portion suitable to them, these germs produce a different substance or product which gives a specific flavour when the cream is tasted, or its product acting on other portions of the cream may produce a flavour by which it is possible to

diagnose the change as either good or bad. Thus, putrefactive germs will produce bad flavours from their action on the curd, and it is this breaking down of the cheesy part of the milk which, in nearly all cases, causes a cream to be second class. Fermentative germs, such as yeasts, cause the formation of substances quite apart from, say, souring bacteria, yet both attack the same portion of the cream. Different organisms either do or do not produce gas, and thus the cream has or has not a particular smell that is pleasant or offensive according to the germs present and the portion of the cream attacked. In some cases a change in the physical condition is noticeable to the eye or palate, such as ropy appearance or a gummy taste, and these are brought about by particular germs. It will be seen by the farmer that cream grading is a scientific accomplishment with fixed laws to govern it, and not merely a matter of the man who is doing the grading having a liking or dislike for this or that cream. In other words, cream grading is governed by fixed and proved methods just as weighing is.

Factory Influence.

As the factory grades so is the farmer guided as to the quality of his cream. It is here that the factory influence is reflected in the qualities of its supplies, and so long as the farmer receives first grade price he has no concern as to the real or actual quality of his cream. Apart from the matter of paying first-class price for second-grade cream (which has by no means infrequently been done), and also apart from the matter of mixing a few second grades into the first grade vat, owing to competition for cream, we have another damaging influence on quality where factories have a big and thickly populated district for local sales. We at times find the factory, in order to keep customers together, mixing second grade cream into the first class vat in order to get a sufficient supply of butter for that day, and the next day classing out creams not so bad as those put in the day before, because they are not in need of the butter. It will be seen that in this way second class cream is paid for as first, and it must be very misleading to any farmer who tries to follow his quality.

One might ask what about the public? Well, they have to tolerate this inferior butter as there is no better forthcoming, since all the factories in these districts find themselves in the happy position of having a demand which they have trouble in satisfying. If uniform grading existed throughout all the factories, and a farmer's creams were classed first or second purely on its quality, we would find the farmers making an effort to improve the quality of their product, and thus helping to bring about a better state of affairs in the industry.

Conclusion.

It is to be hoped that dairy farmers will endeavour to improve the quality of their cream supplies generally, so that butter may retain its legitimate place as a food, and be in a position to hold its own against the competition of any substitute, such as margarine. All associated with actual dairy farming are urged to give this matter of cream quality their thorough and earnest consideration.

Official Milk and Butter Records.

M. A. O'CALLAGHAN.

ANOTHER batch of records is given below. All the animals in this list are Jerseys, and the feature of the records is the very high yield given by the imported cow Pontorson XII. I saw this beast soon after she was imported as a heifer, and then expressed the opinion to the owner, Mr. Hordern, that I expected she would prove the best dairy cow of that importation. This she appears to have done. Writing in reference to this cow in 1911, I stated that "Whatever her success may be in the Show ring she will, I feel confident, prove a great breeder and a high-class dairy cow." Pontorson has proved to be an extremely high testing animal.

Another very fine record is that put up by Pearl of Retford (imp.), while two other imported cows, viz., New Year's Beauty and Kenta, also give a good advertisement to this herd.

In this issue we also publish the first results of the testing of Mr. H. R. Denison's herd, and the figures must be extremely pleasing, as, though none of them have broken records, the average is very satisfactory. The imported cow Pretty May has done very well for such a young beast, and the imported cow Kenta's Twylish, for a two-year-old, has put up a very good record indeed.

In importing cattle of the kind mentioned here these breeders are doing a distinct service to the dairying industry, and to the Jersey cattle of the State. The more that this system of records is developed the greater will be the desire to import only the purely dairy type of cow.

Records of Jersey herd, the property of Mr. J. Warlters, "Sunnyside," Rawdon Island.

Period of Test.	Name of Cow and Herd Book No.	Age at beginning of Test.	Date of last Calving.	Total. Milk.	Total. Butter	Average of Butter Fat Tests.	Yield on last day of Test. Milk.	Yield on last day of Test. Butter.
		y. m.		lb.	lb.		lb.	lb.
273	Clytie of Clydebank, 1717	3 0	25 Sept., 1913 ..	3,709	217	5·1	9·0	0·61
242	Geraldine of Halecote ...	4 0	21 Sept., 1913 ...	3,675	223	5·6	2·50	0·22
273	Evangeline of Halecote...	3 0	25 Nov., 1913 ...	4,057	274	6·0	11 00	0·85
273	Marchioness of Clydebank, 2289.	3 0	27 Nov., 1913 ..	4,252	239	4·9	12·50	0 76

Records of Jersey herd, the property of Mr. S. Hordern, "Retford Park," Bowral.

Period of Test.	Name of Cow and Herd Book No.	Age at beginning of Test.	Date of last Calving.	Total Milk.	Total Butter.	Average of Butter Fat Tests.	Yield on last day of Test. Milk.	Yield on last day of Test. Butter.
		y. m.		lb.	lb.		lb.	lb.
273	Katey, 476	14 0	23 Jan., 1914 ..	6,330	295	4·1	22·0	1·12
273	Little Uardry, 519 ...	12 0	30 Jan., 1914 .	6,898	373	4·7	24·5	1 41
273	Dawn of Retford, 1810 ..	6 0	10 Jan., 1914 ..	5,093	347	6·1	17·0	1·31
273	Retford Minnie	4 0	9 Jan., 1914 ..	4,527	252	5·0	15·25	0·90
273	Retford Gold	2 7	20 Feb., 1914 ...	3,918	265	5·8	14·5	1·07
273	Kenta (imp.), 2145 ...	9 0	4 March, 1914 ...	7,864	421	4·7	29·5	1·65
273	Retford Queen	2 8	14 March, 1914 ...	4,844	331	6·0	17·5	1·35
273	Retford Girl	2 6	23 March, 1914 ...	4,374	286	5·7	15·0	0·97
273	Patience (imp.)	4 0	24 March, 1914 ...	4,922	371	6·6	15·5	1·24
273	Pearl of Retford (imp.) 1288.	......	5 March, 1914 ..	7,161	522	6·3	27·0	2·01
273	Java's Valentine (imp.) 2111.	5 0	13 March, 1914 ...	5,046	352	6·1	14·0	1·03
273	New Year's Beauty (imp.) 2419.	4 0	27 March, 1914 ..	7,698	446	5·0	26·50	1·91
273	Retford Flirt	2 0	9 April, 1914 ...	3,561	239	5·9	11·0	0·77
273	Fair Girl II, of Jersey Holm, 1932.	5 3	23 March, 1914 ..	4,323	277	5·5	15·0	0·90
273	Rosey Dawn VI, 2579 ...	9 0	11 May, 1914 ...	4,147	311	6·5	10·0	0·63
273	Pontorson XII (imp.), 1301.	6 0	16 May, 1914 ..	6,906	581	7·2	18·0	1·49
273	Retford Kenta	1 8	10 May, 1914 ...	4,206	276	5·6	9·50	0·61
273	Leda's Picture, 2201 ...	4 4	19 June, 1914 ...	4,543	384	7·3	15·0	1·39
273	Fawn IV, 1969	9 0	5 July, 1914 ..	6,239	350	4 9	13·0	0·76

Records of Jersey herd, the property of Mr. H. R. Denison, "Eumaralla," Gulgong.

Period of Test.	Name of Cow and Herd Book No.	Age at beginning of Test.	Date of last Calving.	Total. Milk.	Total. Butter.	Average of Butter Fat Tests.	Yield on last day of Test. Milk.	Yield on last day of Test. Butter.
		y. m.		lb.	lb.		lb.	lb.
211	Daisy IV, 950	9 0	20 Oct., 1913 ...	4,112	274	6 0	16·0	1·33
273	Daisy VI, 1779	5 7	17 Dec., 1913 ..	5,775	375	5·7	18·5	1·37
273	Insie VI, 1085	7 0	3 Jan., 1914 ..	6,625	440	5·9	18·0	1·22
273	Pretty May (imp.) 15725 E.J H.B.	4 6	11 Jan., 1914 ..	7,863	496	5 7	19·5	1·41
273	Insie VII, 1086	7 0	28 Feb., 1914 ..	6,003	372	5·4	17·0	1·04
273	Daisy VII, 952 ..	6 0	3 March, 1914 ...	6.480	371	5 0	17·0	1·10
273	Kenta's Twylish (imp.)..	2 2	2 May, 1914 ..	4,779	322	5·9	14·5	0·98
273	Buttercup VIII, 877 ..	7 8	4 May, 1914 ...	6,309	377	5·2	19·0	1·26
273	Ginny, 1037	6 9	11 May, 1914 ...	4.035	252	5·4	9·0	0·58
273	Princess XIV, 1320 ...	6 0	1 June, 1914 ...	6,123	374	5·3	11·0	0 69
273	Silver Bet	4 0	3 June, 1914 ..	6,390	407	5·5	16·0	1·60
273	Bet, 854	7 6	18 June, 1914	7,560	456	5·3	19·0	1·23
273	Topsy VII	8 7	24 July, 1914 ..	6,793	367	4·7	12·5	0·84

A Descriptive Catalogue of the Scale Insects ("Coccidae") of Australia.

[Continued from page 423.]

WALTER W. FROGGATT, F.L.S., Government Entomologist.

Genus XIX. *Ctenochiton*, Maskell.

Trans. N. Zealand Inst.. vol xi, p. 208. 1878.
Cockerell, *Canadian Entomologist*, vol. xxxi, p. 332. 1899.

THIS genus contains fifteen species described from New Zealand. Australia, Mexico and Brazil. As nine are peculiar to New Zealand, and four indigenous to Australia, it is evidently representative of this region.

Maskell says: "Test of female waxy, with a single fringe of tooth-like more or less broad segments round the edge. The margin of the body in the second stage of the development of the female usually presents a waxy appearance, formed by a series of re-entering curves." Antennæ, six or seven jointed.

"The presence of the fringe at some period of the female's development distinguishes all the members of this genus from those of *Ceroplastes* and *Vinsonia*."

Ctenochiton araucariæ, Green.

Anns. and Mag. Nat. History (7), vol. vi, p. 449, pl. xi, fgs. 2–2*a*. 1900.

This species was found upon the foliage of Bunya pine (*Araucaria* sp.) in Victoria. Green placed it in this genus somewhat doubtfully, as it differs from the typical members in the female having no felted or cottony covering.

Adult female oblong, oval, strongly convex on dorsal surface, naked or covered with an imperfect coating of brittle waxy plates. Colour, dark chestnut. The dorsal surface very rugose, with a well defined median ridge. Antennæ, eight-jointed; legs stout; anal scales usually widely divergent: anal ring with six stout hairs margined with stout spines. Length. 5 mm., Breadth, 3–3½ mm.

794. *Ctenochiton araucariæ.* Cat. Coccidæ, p. 159.

Ctenochiton cellulosus, Cockerell.

Victorian Naturalist, vol. xvi, p. 88. 1899.

Type specimens of this species found upon the foliage of a ti-tree (*Melaleuca nodosa*) at Myrniong, Victoria.

Adult female reddish brown, with a margin of short spines; mouth parts small; antennæ slender, composed of eight segments; anal ring with six bristles.

Puparium white, waxy, with yellowish tint, regularly rounded, without keels, convex, rugose, dotted all over with large air cells, without any true fringe. Length, $\frac{1}{6}$ inch.

796. *Ctenochiton cellulosus.* Cat. Coccidæ, p. 159.

Ctenochiton eucalypti, Maskell. (Plate XII, fig. 1.)

Trans. N. Zealand Inst., vol. xvi, p. 52; pl. iii, figs. 1–12. 1894.

This species was found in all stages of development upon the foliage of *Eucalyptus siderophloia* in the Maitland and Newcastle districts, New South Wales.

Adult female dark-reddish brown, with the whole of the dorsal surface covered with white waxy plates, irregular in form; these plates are so brittle that they are often more or less broken away, leaving the female exposed. General form convex, broadly elliptical, with four transverse impressions on the outer portion of the thoracic segments, and fringe of fine hairs round the outer margin, antennæ and legs well developed. Length, $\frac{1}{7}$ inch.

Male puparium white, semi-transparent, formed of a number of glassy plates, broadly oval, margins flattened, centre convex. The central portion formed of three plates, with larger quadrangular plates on the sides. Length of male puparium, $\frac{1}{10}$ inch.

801. *Ctenochiton eucalypti.* Cat. Coccidæ, p. 160.

Ctenochiton rhizophoræ, Maskell.

Trans. N. Zealand Inst., vol. xvi, p. 54; pl. iii, figs. 13–17. 1894.

Collected upon the foliage of the mangrove (*Rhizophora mucronata*) at Brisbane, Queensland.

Adult female greyish brown, oval, convex, with rather long marginal spines; abdominal cleft and lobes normal. Length, $\frac{1}{8}$ inch.

Female puparium consisting of plates of dull white wax on margins, and forming a broad irregular mass in the centre of back of female, striated on the sides.

Maskell says: "This species comes nearest to *C. flavus* from New Zealand, and differs from *C. eucalypti* in colour, in the characters of second stage in smaller larvæ, and long marginal hairs.

807. *Ctenochiton rhizophoræ.* Cat. Coccidæ, p. 161.

Ctenochiton serrata, n.sp.

This beautiful species was collected by Mr. L. J. Newman, on the leaves of an undetermined species of *Acacia*, at Geraldton, West Australia.

Adult female reddish brown, flattened, elongate, oval, with the central portion showing a slight dorsal stripe; anal cleft triangular with the extremities of the anal segment rounded and turning inwards. Length, $\frac{1}{7}$ inch.

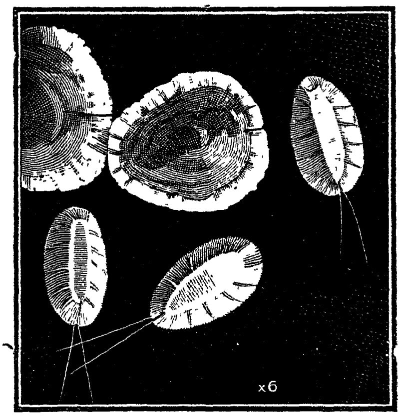


Fig. 1.—*Ctenochiton eucalypti.*

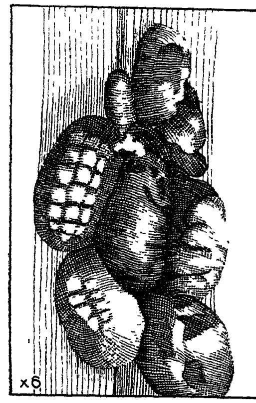


Fig. 2.—*Ctenochiton transparens*

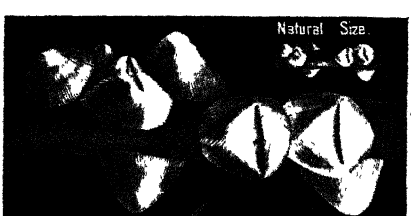


Fig. 3.—*Inglisia foraminifer.*

SCALE INSECTS OF AUSTRALIA. PLATE XII.

The whole dorsal surface covered with crystalline wax, produced in short angular thorn-like plates; the central portion consisting of four parallel rows of semi-transparent wax, with the outer margin fringed with a projecting rim of much larger angular plates of bright yellow wax. This wax is easily removed with chloroform, leaving the naked, elongated, oval coccid exposed to view.

The male test is shaped like a slipper, rounded at the toe and truncate at the hind margin; the rounded dorsal surface covered with pale crystalline plates of irregular shape, with the front and margins yellow, the former covered with short waxy spines.

Ctenochiton transparens, n.sp. (Plate XII, fig. 2.)

This curious species was obtained by Mr. L. J. Newman, upon the foliage of an undetermined species of *Acacia*, near Geraldton, West Australia.

The adult female is enveloped in an oval rounded mass of pale yellow waxy matter, with no apparent structure on the dorsal surface, but on the margins against the leaf produced into a fringe of irregular flattened angular plates, right round the margin. Cleared of the waxy matter, the female measures $\frac{1}{8}$ inch in length; dull yellow, mottled with dark-brown; convex longer than broad, with the cephalic region rather narrow in front, and the anal segment contracted almost into a peg at the extremity; the dorsal surface covered with irregularly rounded pits, forming two parallel rows down the centre and a similar band round the sides. Viewed from the under surface the coccid is dried up to a thin shell, and might be likened to a dish cover with a tuft of cottony secretion occupying the centre of the cavity. Short, stout antennæ and small legs, very prominent, standing out from the surface. Anal segment contracted; when treated with potash shows each side forming a broad rounded tip.

Treated with potash there appears to be no distinct structure in the epidermis; antennæ small, indistinct, legs small.

Male tests composed of white crystalline wax, showing no defined plates on the back, but produced into blunt spines in front and round the margin. General form very much rounded, longer than broad, but broader in proportion to length than usual; rounded in front, truncate behind.

Genus XX. *Inglisia*, Maskell.

Trans. N. Zealand Inst., vol. xi, p. 213. 1878.
Coccidæ of New Zealand, p. 75. 1887.

This genus was created by Maskell to contain five species of lecanid coccids he described from New Zealand. He defined it thus:—"Test of female glassy, elevated, striated with radiating rows of air cells. Fringe not always present in the adult stage."

The remarkable tests are constructed in several sections of hard glassy plates, finely striated, forming a shell around the adult coccid. In the New

Zealand species these tests are more or less pointed at the apex, but on the Australian forms the two main sections are impressed on the summit with an elongate, narrow, deep depression. The adult female coccid is convex, corrugated, and furnished with legs and antennæ. Other species have been described from Mexico, India, and Trinidad. Cockerell in determining a species allied to the Australian forms, with the impression on the dorsal surface of the test, placed it and our two Australian species in a new genus he called *Cardiococcus,* the only point of difference from *Inglisia* being the dorsal pit in the female test.

I have retained our species in Maskell's genus, for it seems to me, that a transverse depression in the otherwise similar test of a coccid is hardly sufficient to remove it from the group under which it is well known to writers on Coccidæ.

The species have a very wide range in Australia.

Inglisia foraminifer, Maskell. (Plate XII, fig. 3.)

Trans. N. Zealand Inst., vol. xxv, p. 213; pl. xii, figs. 1–5. 1892.
Fuller, *Journal of Depart. of Agric., West Australia,* p. 1345. 1897.
Fuller, *Trans. Ent. Soc. London,* p. 460. 1899.
Cardiococcus foraminifer, Cockerell, *Ann. and Mag. N.H.* (7), vol. xi, p.156. 1903.

This, like the following species, has a wide range over Australia. The type was described from South Australia, on the Quandong tree (*Santalum acuminatum*) (Tepper). It has been found near Geraldton, West Australia, on a *Loranthus* parasitic on the same tree (Lea). Fuller described this one, under the name of *loranthi* as a new variety, but the only difference from the typical form is the absence of legs in the adult female coccid. I have collected it at Yass, New South Wales, and in several other western localities on undetermined shrubs.

Adult female rich dark-brown, filling the whole of the test ; concave beneath with central depression on the back, corresponding with that on the test. Antennæ thick, conical, six-jointed; feet, very small; margins of coccid fringed with spines; abdominal cleft conspicuous. Length, about $\frac{1}{11}$ inch.

Female tests massed together all over the twigs and leaf stalks, with a general appearance of little limpets, composed of light-brown semi-transparent glassy plates, very finely striated, forming a conical structure in two sections, fitting close together, but easily separated. At the apex is a narrow, key-hole like, deep depression or pit, in both sections, causing the apex of each test to become truncated. Length, $\frac{1}{13}$ inch. Specimens from West Australia are much larger.

Male tests of a similar structure, but more elongate, smaller, not impressed at the apex, which is truncated and furnished with a hinged plate, by means of which the imprisoned male is able to emerge when he reaches maturity.

809. *Cardiococcus foraminifer.* Cat. Coccidæ, p. 161.

Inglisia fossilis, Maskell.

Trans. N. Zealand Inst., vol. xxix; pl. xx, figs 1–4. 1897.
Cockerell, *Ann. and Mag. N.H.* (7), vol. xi, p. 156. 1903.

This species was described from specimens obtained on an undetermined species of Acacia at the Darling Range, West Australia (Lea); others were collected on a polygonum (*Muhlenbeckia adpressa*), Murray River, Victoria (French). I have taken it upon an undetermined shrub, near Warialda, New South Wales. Maskell described the Victorian specimens under the varietal name of *major*, the chief difference being the larger size and green tint.

Adult female, dark, glossy brown; general form, conical, margins slightly flattened; antennæ and feet absent; abdominal cleft wide and narrow, the margin of the body with minute spines.

The female test is formed in a similar manner to that of the previous species though more deeply and broadly impressed at the apex; more cone-shaped, and not so much divided at the apex as shown in Maskell's plate. General colour yellowish brown, with the margins glassy. Length, $\frac{1}{7}$ inch; width, $\frac{1}{8}$ inch; height, $\frac{1}{9}$ inch.

Maskell says: "This species is allied to *I foraminifer*, but differs in the form of the test, in the absence of feet and antennæ, and in other particulars. It is viviparous, the female being usually full of larvæ."

810. *Cardiococcus fossilis.* Cat. Coccidæ, p. 162.

Genus XXI. *Ceroplastodes*, Cockerell.

The Entomologist, vol. xxvi, p. 350. 1893.
Canadian Entomologist, vol. xxxi, p. 333. 1899.
Green, *Coccidæ of Ceylon*, Part iv, p. 284. 1909.

This is a small genus containing six described species, three of which come from New Mexico, two from Ceylon and India, and one from Australia. In the original description, Maskell placed our species doubtfully in the genus *Eriochiton*.

The members of this genus, like those of the genus *Inglisia*, are enclosed in a glassy test, which differs in being convex, but not cone-shaped, not divided at all, but rough or covered with protuberances. A more or less hemispherical scale, covered with dorsal knobs. "Legs and antennæ well developed. Stigmatic clefts well defined; each cleft with a single, very long pointed, stigmatic spine. Margin of body with a fringe of stout conical spines, usually in two or more rows. Other characters as in *Lecanium*." (Green.)

Differs from *Inglisia* and *Ctenochiton* in having the body of the adult female shrinking up, and allowing for a cavity for the eggs and larvæ.

Ceroplastodes melaleucæ, Green.

Eriochiton ? melaleucæ, Victorian Naturalist, vol. xvii, p. 12. 1900.

This species was found upon a ti-tree (*Melaleuca nodosa*) growing at Myrniong, Victoria.

Adult female oblong, oval, rather convex, with a complete marginal series of pointed conical spines, and a long curved spine at each stigmatic cleft. Anal ring with six short hairs; anal lobes irregularly triangular; apex bluntly rounded and incurved. Length, about $\frac{1}{8}$ inch.

Puparium or test of female subglobular or hemispherical, somewhat longer than broad, completely enclosing the coccid, "compact glassy or waxy brittle plates, roughened with numerous irregular waxy granules, which give it the appearance of being closely set with grains of white quartz sand." Oval aperture above the anus. Length, about $\frac{1}{8}$ inch; breadth, $\frac{1}{10}$ inch.

828. *Ceroplastodes melaleucæ*. Cat. Coccidæ, p. 164.

(*To be continued.*)

Suspension of Stallion Parades.

The following intimation has been forwarded by the Chief Inspector of Stock to the Secretaries of the various Agricultural Societies.

"*Re* the Government scheme for the examination and certification of stallions now in operation for the past few years, I beg to advise you that on account of the Veterinary Staff of this Branch being very considerably reduced, many of the officers having joined the Expeditionary Forces, and it being impossible to fill the vacancies, the Honorable the Minister for Agriculture has approved that no examination for stallions at country centres be undertaken for this year.

"It might be pointed out that the present scheme is a voluntary one, and has never been considered satisfactory, in that it does not prevent rejected stallions from still being used for stud service. With a view, therefore, of placing the horse-breeding industry on a better footing, it is proposed to effect by legislation that only duly approved and licensed stallions may be allowed for the public service of mares. To this end a draft Bill has been prepared, and it is hoped that it may become law during the present year.

"I might add that horse-owners holding seasonal certificates for stallions can, if they care to, forward them here, and get them extended for another year."

Citrus Canker in America.

The Outbreak of a New Disease.

G. P. DARNELL-SMITH, B.Sc., F.I.C., F.C.S., Biologist.

Attention has been called in the Press to the outbreak of a new disease, viz., Canker, in the citrus groves of Florida. The disease is, according to all accounts received, of a most damaging character, and extremely infectious. Growers in Florida are making most praiseworthy attempts to stamp out the disease, sacrificing their trees by burning them. It is to be hoped that such drastic measures will meet with their due reward.

Nevertheless, those who are familiar with the adaptability of fungi, and their manifold devices for continuing their existence, view with some trepidation the appearance of any new disease. In spite of the most careful scrutiny and of every precaution fungous diseases may spread. Bearing this fact in mind, we publish the following extracts from American Bulletins concerning this disease, in order that those interested in the production and marketing of citrus fruit may be on the lookout for the disease if it should gain a footing. In relation to the extent and nature of the disease, the Monthly Bulletin of the State Commission of Horticulture, Sacramento, California, December, 1914, says:—

"The Gulf States from Florida to Texas are much concerned because of the appearance of citrus canker in their groves. Mr. E. W. Berger, Inspector of Nursery Stock, University of Florida, Gainsville, in an official tour of inspection in 1912, found the disease in Alabama and Mississippi. It was already known to exist in Florida and Texas, and Mr. Berger thinks it may also be in Louisiana, though a limited inspection failed to discover it. It has since been found in Louisiana.

The supposed nativity of citrus canker is Japan. It is a fungous disease, and attacks twigs, leaves, and fruits of most, if not all, species of citrus. It blights the twigs, causing numerous slender twigs to push out, reminding us somewhat of peach yellows. It spots the leaves, causing them to turn yellow, and to fall prematurely from the trees. Its attack on the fruit resembles scab, for which it has been mistaken. The scarring of the fruit ruins it for market, although not really for eating, as the scarring is only skin deep.

The following is taken from Bulletin 122, Florida Agricultural Experiment Station: "Citrus Canker," a preliminary bulletin by H. E. Stevens:—

Nature of the Disease.

The cause of the disease has not been determined, but sufficient data have been collected to show that the malady is infectious, and probably more injurious to grape fruit than any fungous disease known at present. So far in Florida the disease has only been found in nursery stock, and is confined mainly to grape fruits. Infections have been observed on *Citrus trifoliata*, and on the Satsuma; but the latter seems to be fairly resistant. The sweet orange is apparently not affected. The leaves, young shoots, twigs, and fruit of grape fruit are all attacked.

Appearance.

The disease appears as small circular spots, from less than one-sixteenth to one-quarter of an inch across. They may occur singly, or several together may form an irregular area.

They are raised above the surrounding tissue, are light brown, and composed of a spongy mass of dead cells covered by a thin (white to grayish) membrane that finally ruptures and turns outward, forming a ragged margin around the spot. The general appearance of the spots is much the same whether they are found on the leaves, fruit, or twigs. The older spots often become overgrown with saprophytic fungi, and may be pink or black, on account of secondary infection by species of *Fusarium* or *Cladosporium*.

The infections on the leaves appear first as small watery bulging dots, which are usually of a darker green than the surrounding tissue. They may appear on either surface of the leaf, but do not penetrate through the leaf tissue at this stage. The spots gradually increase in size, change to a light brown colour, and become visible on both sides of the leaf. The spot may project from the surface on one or both sides of the leaf. Each spot is surrounded by a narrow yellowish band or zone. Later the surface of the spot becomes white to grayish, and finally ruptures, exposing a light brown central mass. The spots on the fruit are similar to those on the leaves. They project from the surface, and retain a circular outline. They do not penetrate far into the rind, and may be scattered singly over the surface, or several may occur together, forming irregular masses.

The spots on the older twigs are more prominent, and usually larger and more irregular in shape They show the same spongy tissue and the same colours as those on leaves. On growth more than a year old, the spots assume a cankerous appearance, and the membrane covering the surface disappears. The spots do not penetrate the wood, but are confined to the outer tissues of the bark.

Distinction from other Diseases.

The other citrus diseases with which this one is likely to be confused are scab, scaly bark,* and, possibly, anthracnose. It can be distinguished from any of these by the following points of difference :—

(1) It differs from scab in the roundness of the typical spots, in the larger size of the spots, and in their white or grayish colour. It does not distort the leaves, nor cause the wart-like projections that are common in infections of scab. Canker is found on the older woods, while infections of scab never occur on older twigs or branches.

(2) It differs from scaly bark in producing much smaller spots, which are more circular in outline. Scaly bark spots usually show a hard glazed surface, while canker is more spongy. Canker is common on the grape fruit, and forms spots on the leaves, while scaly bark rarely attacks grape fruit or causes spots on the leaves.

(3) Canker differs materially from anthracnose spotting. Anthracnose spots are sunken, usually many times larger, and much firmer and more compact. Anthracnose occurs only on fruit, and does not attack young shoots or twigs.

The California Monthly Bulletin, previously mentioned, states :—

Florida, Louisiana, and Alabama have issued quarantines against citrus nursery stock because of this disease. It is most severe on pomelos, but attacks Satsumas and all kinds of oranges. As yet we feel certain that the disease does not occur in California.

Our strict inspection . . . and our quarantines . . . will do much to safeguard our citrus growers. We urge all our county horticultural commissioners and growers in citrus districts to keep a close watch for any possible appearance of this disease, for if once established here it would prove a calamity to the State, and certainly to our citrus interests.

It will thus be easily seen that no effort should be too great to keep the disease from our shores, or to eradicate it without delay if it should gain a footing here.

Any suspected specimens should be forwarded to the Department of Agriculture for examination.

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* This disease does not appear to exist in Australia at present.—G.P.D-S.

Insectivorous Birds of New South Wales.

[Continued from page 336.]

WALTER W. FROGGATT, F.L.S., Government Entomologist.

No. 53. The Yellow-rumped Tit (*Acanthiza chrysorrhoa*).

THIS well known little bird is a typical representative of the genus *Acanthiza* which contains twelve species peculiar to Australia. It is known as the "Tomtit" to many school children, but in Tasmania is popularly known as the "Yellow-tail." It ranges over the greater part of Australia, usually going in small flocks, flying low, and giving a low chirping cry as it flits along.

This little bird has the remarkable habit of constructing a double house, for on the top of its somewhat loosely woven oval structure it builds a circular rimmed dish like a second shallow nest. Naturalists have never given any satisfactory reason for this peculiar departure from the usual oval nest, but it has been suggested that it is a resting place for the male bird and perhaps for the mother bird when off duty.

The eggs, usually four in number, are somewhat elongate, pure white, but sometimes slightly spotted. Campbell and other observers have recorded that these little birds have the curious habit of frequently building their nests beneath the larger nests of magpies, crows and hawks. The little Bronze Cuckoo often imposes her eggs upon the tomtit, and selects her comfortable nest as the home for her parasitic fledgeling. These dainty little birds, though insignificant in size, are so plentiful in gardens where they are not molested, that, being always at work, they must consume a very large number of the smaller plant-infesting insects that would soon injure flowering plants.

This is the same bird as that referred to as the "Yellow-rumped Thornbill" (*Geobasileus chrysorrhous*) in the list of birds protected in New South Wales, referred to on page 29 of the January issue of *The Agricultural Gazette.*

No. 54. The White-fronted Chat (*Ephthianura albifrons*).

A denizen of our open plains, often numerous along the edges of water-courses and lignum swamps, this is a semi-gregarious little bird which has a wide range over Australia and Tasmania, and though in the south migratory, it is to be found all the year round in some parts of the State. In the west and north-west upon the saltbush plains in the early summer months if water is obtainable, this, and its two more brilliantly tinted relations, are all known as "Saltbush Birds."

The White-fronted Chat builds a small cup-shaped nest composed of grass and rootlets, lined with hair and feathers and usually placed in a low bush not far from the ground, often in the settled districts in dead thistles; in this well concealed nest she lays from three to four eggs.

The male, with his white throat and black-banded chest (replaced by greyish brown and yellow in the less noticeable female), might, at first sight, be taken for a Sandpiper as it runs along, uttering its plaintive call note, but it can be easily distinguished on closer observation by its different build. It is generally very active towards evening, and if surprised near its nest is very cunning in pretending to be sick or wounded while leading one away in the opposite direction.

The beautiful Orange-fronted Chat (*E. aurifrons*), with its rich golden orange yellow head and breast, and the Red Chat (*E. aricolor*) are both rarer birds than the White-fronted Chat, but in the early summer the writer has often seen all three species in a day's drive across the saltbush plains near Brewarrina.

WEEDS AND THE FARMER.

"IT is said that man can get used to anything. He certainly has become used to acknowledge weeds as his master. They are sprawling like a great evil thing over the country, starving and choking to death millions of plants which are useful to us.

The tribute they take is enormous—incalculable. If we said that but for the weeds our crops would be as much again, we should not be guilty of exaggeration. And at a time when every meal produced at home is of special value, we let millions of them be destroyed by our enemy, The Weeds, because of quite a number of reasons.

Not because we do not know what to do—for we do. We know every detail concerning weeds, their habits of life, their modes of attack, and the best way of attacking and killing them.

But we do not use our knowledge, because it is no one's business in the State to see that we do."—*The Smallholder*.

About one-half natural size.

INSECTIVOROUS BIRDS OF NEW SOUTH WALES.

"YELLOW-RUMPED TIT."

Acanthiza chrysorrhoa.

Slightly under half-size.

INSECTIVOROUS BIRDS OF NEW SOUTH WALES.

"WHITE-FRONTED CHAT."

Ephthianura albifrons.

Third North Coast Egg-laying Competition.

GRAFTON EXPERIMENT FARM.

D. S. THOMPSON, Poultry Instructor.

THE third of the North Coast Egg-laying Competitions concluded on 31st March last, after running the full period of twelve months. The results emphasise the importance of the industry as a valuable adjunct to other branches of agriculture in the North Coast districts.

Weather Conditions.

The weather conditions during the year were very favourable for egg production. The autumn and winter was very mild, with a normal rainfall, while the summer was cool but very dry. The rainfall during the currency of the test was 35·33 inches, which is below the average. A few very hot days were experienced, as must be expected in the district, but there were no deaths from heat apoplexy.

Breeds.

Some idea of the popularity of the White Leghorns on the North Coast may be found in the fact that no fewer than 26 of the 35 pens were occupied by birds of that breed. Of the remaining 9 pens, 4 were occupied by Brown Leghorns, a similar number by Black Orpingtons, and 1 by Silver Wyandottes.

Results.

The average number of eggs laid was somewhat lower than last year, being 182 per hen as compared with 190 per hen during the 1913-4 competition, while the first test averaged 156 eggs per hen for the nine months from 1st July, 1912, to 31st March, 1913.

Committee of Management.

The following constituted the committee which controlled the Competition:—

A. H. Haywood, Manager, Grafton Experiment Farm.
J. Hadlington, Poultry Expert, Department of Agriculture.
M. L. Myers, Registrar, Grafton Experiment Farm (acting as Secretary).
D. S. Thompson, Poultry Instructor, Grafton Experiment Farm.

H. G. McKittrick, F. W. Collison, W. E. Butters, A. E. Crouch, E. E. Crispin (part), E. O. McKittrick,	Members elected to represent the competitors.

Financial.

From the financial standpoint, the outstanding feature of the Third Competition has been the increased cost of almost all food supplies, particularly so in wheat and its products, and the reduced price realised for eggs for the year. The result stands out boldly in the net return per hen, over cost of feeding, of only 6s. 5d., as against 10s. 9d. for the previous year.

Expenditure.

As in previous years, maize and green feed were grown on the farm, and charged at actual values. All other supplies were purchased, generally in the Sydney market.

The actual costs of the various foods, allowing for freight charges, averaged for the year, worked out as follows :—

Pollard, 1s. 4d. per bushel; bran, 1s. 4d. per bushel; wheat, 5s. 2d. per bushel; oyster-shell grit, 4s. 8d. per cwt.; ox livers, 6d. each; maize, at net prices on the farm, 3s. 6¼d. per bushel; green rape and lucerne, 10s. per ton.

At the above rates, the food bill was as follows :—Wheat, £29 11s. 1d.; maize, £22 10s. 8d.; pollard, £27 5s. 4d.; bran, £8 19s. 11d.; green feed, £4 11s. 3d.; shell grit, £2 6s. 8d.; livers, £5 2s.; total, £100 6s. 11d.; working out at an average cost of 9s. 7d. per hen for the twelve months.*

Revenue.

The method of selling was the same as in previous years, *i.e.*, "on commission" in the Sussex-street Market.

The net proceeds, after deduction of all shipping and selling expenses, were £168 2s., being the cash return on the farm. The net value of eggs, for each hen, was thus 16s. for the twelve months.

This will give a return of £67 15s. 1d., over and above cost of feeding, to recompense for labour and capital invested. Each hen would contribute 6s. 5d. to this total.

Monthly Price of Eggs.

Eggs realised, net, in April, 1s. 9d.; May, 1s. 9½d.; June, 1s. 6d.; July, 1s. 2¾d; August, 9d.; September, 8½d.; October, 8d.; November, 8¼d.; December, 11¾d.; January, 1s. 2½d.; February, 1s. 3d.; March, 1s. 6d. per dozen. Taking into consideration the quantity sold each month, the average actual value, on the farm, for the period under review, was 1s. 0¼d. per dozen.

Breakages in Transit.

Breakages were reported in 58 out of 95 consignments; this was slightly worse than last year, so that no progress can be reported in this respect.

* The Department has noted that considerably more feed was used in this competition than in connection with the two previous tests at Grafton. This has in part accounted for the high cost of feed per hen.—ED.

RETURN showing results of Third North Coast Egg-laying Competition, 1st April, 1914—31st March, 1915.

Order of Merit.	Owner and Breed.	Eggs laid— April.	May.	June.	July.	August.	September	October	November	December.	January.	February.	March.	Total.	Weight of eggs per doz.	Weight of birds on entering.	Weight of birds on leaving.	Deaths or replacements during competition.	Market value of eggs.
															oz.	lb.	lb.		s. d.
*1	Experiment Farm, Grafton: White Leghorns	127	135	51	96	132	154	118	139	113	117	91	69	1,402	24	21	21½		121 6
2	Masters, H. M., Steve King's Plains: White Leghorns.	96	129	91	103	134	133	138	143	122	83	88	60	1,325	24	19	20½		122 6
3	Long, H., Grafton: White Leghorns	113	125	78	102	136	142	155	145	109	101	51	5	1,262	24	20	20½		114 2
4	Hewitt and Harrison, Lismore: White Leghorns	107	118	68	105	135	128	149	127	112	62	82	63	1,256	24	20	21		114 8
5	Dockrill, W. J., Casino: White Leghorns	93	114	73	87	127	129	138	116	116	86	81	46	1,206	25	22	22½		100 7
6	McKittrick, Mrs. H. G., South Grafton: Black Orpingtons.	33	115	86	125	144	131	134	115	127	85	57	31	1,183	23½	23	31	1	104 9
7	McKittrick, E. O., South Grafton: White Leghorns	70	110	65	99	128	133	124	143	121	68	74	30	1,165	24	22½	21		103 10
8	McDougall, J. C., South Grafton: White Leghorns.	61	97	72	111	124	130	140	139	98	75	70	16	1,163	24	19	19		103 3
9	Butters, W. E., Coutts' Crossing: White Leghorns	75	93	84	113	129	128	132	131	123	54	80	19	1,161	25½	20	24½		103 1
10	Hattersley, A. E., Maclean: White Leghorns	111	98	96	116	132	109	110	106	85	63	69	62	1,157	21	21	22		109 6
11	Collison, F. W., Maclean: White Leghorns	69	108	59	112	128	133	146	115	90	63	87	39	1,149	25	21	23½		102 11
12	Kimpton, F. W., South Lismore: White Leghorns	84	121	52	107	132	129	127	114	111	76	68	18	1,139	24	20	23		103 0
13	Collison, F. W., Maclean: Brown Leghorns	41	101	80	91	129	133	140	115	101	65	88	45	1,129	24	21	23½		100 0
14	Templeton, F. N., Upper Copmanhurst: Brown Leghorns.	64	95	71	84	124	128	124	126	126	78	67	32	1,119	24	22	20½		99 1
15	Marr, K. G., Bangalow: White Leghorns	107	108	80	93	114	130	125	117	83	62	67	25	1,111	25	20	21	1	102 7
16	Gregor, A. L., Byron Bay: White Leghorns	57	81	73	107	131	134	121	126	107	62	54	34	1,090	25½	19	21½		91 4
17	Hewitt, T., jun., Lismore: White Leghorns	64	105	72	113	118	131	133	128	83	40	35	67	1,089	25½	18	20½		97 11
18	George, K., Grafton: White Leghorns	62	102	70	92	129	127	143	126	93	50	48	41	1,083	24	20	22½		95 9
19	Crispin, E. E., Grafton: Silver Wyandottes	55	123	69	120	116	127	112	124	74	73	52	28	1,073	23½	24	27		97 5
20	Lunney, H., South Lismore: White Leghorns	66	105	58	105	114	118	129	122	92	74	63	26	1,072	21	20	23		96 1
21	Harrison, Mrs. E., Lismore: White Leghorns	73	112	63	114	126	115	133	112	74	41	52	46	1,061	26	19	20½		96 3
22	Bodley, A., jun., Bungawalbin: White Leghorns	68	105	42	78	112	123	116	115	90	87	68	43	1,047	24	20	21½	1	91 6
23	McKittrick, H. G., South Grafton: White Leghorns	37	66	16	82	122	123	143	152	130	76	60	36	1,043	25	20	23½		86 0
24	Gerard, W. O., Glenugie: White Leghorns	49	103	42	102	119	121	124	136	104	34	80	18	1,032	26	20	26½	1	89 9
25	Casey, T. T., Maclean: White Leghorns	43	91	52	81	117	123	146	142	106	40	53	33	1,027	26	20	21		87 8
26	Young, Mrs. J., Grafton: Brown Leghorns	29	102	41	58	112	126	131	115	104	51	83	59	1,011	23	20	22½		88 4
27	Moreton, D. S. H., Coraki: White Leghorns	12	78	9	66	148	128	142	144	124	59	62	37	1,009	25½	21	23		81 2
28	Loeson, J., Bungawalbin: White Leghorns	56	65	60	58	122	112	131	123	109	76	43	18	1,003	26	21	24		86 9
29	Moreton, D. S. H., Coraki: Black Orpingtons	2	41	71	96	135	116	114	137	89	101	52	48	1,002	21½	31	38	1	83 1
30	Crouch, A. C., Grafton: White Leghorns	22	83	57	84	114	126	122	125	91	60	50	67	1,001	25	24	22½		86 8
31	Barratt, G., Coolmangar: Brown Leghorns	46	96	71	77	124	110	120	111	92	12	58	41	964	24½	20	22		85 2
32	Bodley, A., jun., Bungawalbin: Black Orpingtons	11	23	27	96	125	126	118	100	108	104	52	50	940	24	32	33		76 5
33	Gosper, J., Carr's Creek, Grafton: White Leghorns.	37	54	58	94	112	119	125	111	69	58	58	40	935	24	21	21	1	79 11
34	Crispin, E. E., Grafton: White Leghorns	53	79	51	69	108	107	116	106	79	81	51	27	927	25½	20	23½	1	81 9
35	Hampson, H. H., North Lismore: Black Orpingtons	0	39	88	89	118	130	110	109	76	45	67	27	898	24½	26	35		71 4
	Totals	2,093	3,320	2,196	3,330	4,373	4,412	4,565	4,355	3,561	2,362	2,261	1,106	38,234				7	
	Average per hen	9·9	15·8	10·4	15·8	20·8	21·0	21·7	20·7	16·9	11·2	10·7	6·6	181·0					

* Non-competitive as regards prize-money.

These ranged from ¼ dozen to 15¾ dozen in the case, the general average being about ½ dozen. In the consignment in which 15¾ dozen were broken, the shipping company concerned made reparation.

The Prize List.

The Grafton Experiment Farm pen came first in the aggregate and second in market value, but, being non-competitive, does not participate in prize money.

H. M. Masters—First aggregate prize, £5 ; First market value of eggs, £1 10s. ; first prize winter test, £3.

H. Long—Second aggregate prize, £3 ; third prize market value, 10s. ; third prize winter test, £1.

Hewitt and Harrison—Third aggregate prize, £2 ; second prize market value, £1.
W. J. Dockrill—Fourth aggregate prize, £1 10s.
E. O. McKittrick—Fifth aggregate prize, £1.
J. G. McDougall—Sixth aggregate prize, 10s.
D. S H. Moreton—First utility prize, £1 10s. (Black Orpingtons).
A. E. Hattersley—Second prize winter test, £1 10s.

The following participated in the monthly prizes, viz. :—H. Long, H. M. Masters, A. E. Hattersley. D. S H. Moreton, H. G. McKittrick, A. Bodley (Black Orpingtons), A. C. Crouch, F. W. Collison (Brown Leghorns), T. Hewitt, junr.

Certificates (which under the rules were to be issued to all pens laying 1,150 eggs during the Competition) were awarded to the following:—Grafton Experiment Farm, H. M. Masters, H. Long, Hewitt and Harrison, W. J. Dockrill, E. O. McKittrick, J. C. McDougall, W. E. Butters, A. E. Hattersley, all for White Leghorn pens.

Poultry Notes.

June.

JAMES HADLINGTON, Poultry Expert.

The difficulty now being experienced by poultry-keepers in the matter of food supplies for their flocks raises the question as to the availability, and extent, to which substitutes can be used to replace the usual wheat, bran, and pollard portion of the orthodox ration. This aspect of the present difficulty has received attention, but it is feared that whatever can be suggested in this connection, with the exception of succulent green feed, such as chaffed lucerne, barley, rape, &c., very little relief is possible in regard to cheapening the poultry ration. While this is so, most poultry-keepers will, doubtless, welcome any suggestion that will enable them to supplement their feed list from any source whatever, and thus assist them in tiding over the present season of scarcity, seeing that any feed is better than no feed, even if results are not quite so satisfactory.

Experience has abundantly proved that the most satisfactory results, both as to growth and eggs, are obtained from the usual pollard, bran, wheat, maize, and oats, which have become the universal poultry foods, not alone from their suitability and known uniform results, but because they have been found the most economical foodstuffs, and more readily obtained in sufficient quantities than almost any other food suitable for poultry.

The question is, what substitutes are available to meet, in some measure, the present shortage? Quite a number of articles, more or less known to poultry-keepers, can be suggested—such as oilcakes, crushed oats, oatmeal, barley meal, barley germ, pea meal, potatoes, vegetables, and green feed—which might, to a very large extent, form part of the morning mash, and the bulk of feed for chickens, and thus help to eke out the bran and pollard portion of poultry food. There are also grains—such as barley, peas, or millet, as well as a very much larger portion of maize than it is customary to feed—which will materially help to tide over the scarcity of chickwheat. Animal foods—such as bullock's liver, sheep's fry, and rabbits—will, of course, all add their quota where available. These should, of course, be cooked, and about 20 per cent. fed in the morning mash should be regarded as the limit to which it is advisable to use them, and much less would be sufficient.

The difficulty one meets in regard to substitutes is that very little is known among the bulk of poultry-keepers as to the quantities which may be used without deterioration of the ration, or preventing it from being made of a suitable consistency.

With a view to helping poultry keepers on this matter, several formulas are here suggested for morning and evening feeds, embracing the substitutes mentioned, and in quantities which it is considered advisable to use them when available. These, also, may be varied somewhat to suit the necessities of any particular case. For example, chaffed green-stuff may be used instead of in the dried form, and in the case of green lucerne or barley might form a third by weight of the total quantity. One oilcake in the place of another, and in some instances one meal in place of another, may be used without materially altering the nutrients, so long as the quantities suggested are not greatly altered. For instance, in case of the oilcake, the quantities mentioned may be regarded as the extreme limit, and in the case of oats, millet, and barley, or any other husk-covered grain, owing to the quantity of fibre that would necessarily be fed, the quantities should not be increased beyond the maximum set out.

In regard to potatoes and other vegetables, these should be boiled and the water drained off, otherwise there may be too much wet material to leave the mash of a proper crumbly consistency for feeding.

It should be understood that it is not claimed that these substitutes will improve the usual ration, or that they are in the main more economical, but are merely put forward as suggestions for augmenting the list of possible foods under the conditions now prevailing.

Morning Mash.

No. 1.

Pollard	30 lb.
Bran	20 „
Linseed oilcake	10 „
Cocoanut „	10 „
Green chaffed lucerne	25 „
Meat meal	5 „
	100 lb.

No. 2.

Pollard	20 lb.
Bran	20 „
Pea meal	10 „
Linseed oilcake	5 „
Cocoanut „	5 „
Crushed oats	20 „
Lucerne (dust or chaff)	15 „
Meat meal	5 „
	100 lb.

No. 3.

Pollard	25 lb.
Bran	20 „
Cocoanut oilcake	15 „
Potatoes	30 „
Meat meal	10 „
	100 lb.

No. 4.

Pollard	20 lb.
Bran	20 „
Barley germ	20 „
Cocoanut oilcake	10 „
Turnips, Swedes or Mangels	20 „
Pea meal	5 „
Meat „	5 „
	100 lb.

22 ounces of salt should be added to the morning mash in each case.

Evening Feed.

Of the various grains which may be fed to poultry, the following combinations are suggested:—

No. 1.

Wheat	40 lb.
Maize	30 ,,
Oats	30 ,,
	100 lb.

No. 2.

Wheat	20 lb.
Maize	30 ,,
Oats	30 ,,
Barley (soaked) ...	20 ,,
	100 lb.

No. 3.

Wheat	20 lb.
Maize	30 ,,
Oats	20 ,,
Millet, (Hungarian, Manchurian, Broom, &c.), or Sorghum Seed. ...	30 ,,
	100 lb.

Even maize alone may be fed much more largely than is the case at present.

A Normal Ration.

As an instance of what may be called a normal and well-balanced ration (the whole giving a nutritive ratio of 1 to 4·5), we may quote that as fed at the Hawkesbury Agricultural College, to the intensive and semi-intensive sections during 1914. The morning feed may be supplied either as dry or wet mash.

Morning Mash.

Pollard	60 lb.
Bran	20 ,,
Lucerne dust	12 ,,
Meat meal (40 per cent. proteids)	8 ,,
	100 lb.

Evening Ration.

Two-thirds wheat.
One-third crushed maize.

Salt, 22 oz., is added to the morning feed. Green feed is given midday.

Smutty Wheat.

Owing to the difficulty of procuring the necessary feed, poultry-keepers are unfortunately compelled to use grain that in normal times would be rejected. One of the worst troubles in this connection is smutty or bunty wheat. Some experiments have been made to determine whether it is possible to clean this class of wheat sufficiently to enable it to be fed to poultry. It has now been found that by submitting this smutty wheat to a process of washing it can be cleaned apparently sufficiently to be regarded as not only safe, but very little inferior to samples of second-grade wheat. The method adopted in the experiment was to pour the grain very slowly into a bath of water, stirring it gently so as to liberate the smut from the grain without dissolving the smut-balls or particles. The care with which this is done is the measure of success in floating off the maximum quantity of smut, because it is found that once the smut particles are wet through they sink, and attach themselves to the mass of grain at the bottom. The

best results were obtained by using a half cask as a bath with one of the staves cut $1\frac{1}{2}$ inches below the top of the vessel, which means an aperture of approximately 4 x $1\frac{1}{2}$ inches. This, of course, forms an outlet for an overflow to take away the water upon which the smut balls, spores, and other particles float away. The cask is filled up to the level of the overflow with water, and the wheat is then poured in steadily and a little at a time, so as to allow the smut to detach itself from the grain. By using plenty of water it is found that the wheat can be effectively cleaned in this way.

This, of course, will mean treating each day's supply as required. It may be fed wet, or may be spread out in the sun to dry, and then fed in the usual way This is quite a simple process involving but little effort, and should enable poultry-keepers to feed this class of wheat, which would, without treatment, be somewhat risky, and at any rate unsuitable for poultry feed.

Flour and Bran.

As the result of some enquiry in regard to mixing flour and bran in the absence of pollard for the morning mash, an experiment was carried out to determine what quantity of flour would be required to mix with bran to make it of a fair mechanical consistency, and of much the same feed value as in the case of using pollard. Several proportions were tried, and in different ways. It was found that by using flour in its raw state, quite 40 per cent. was required to "bind" the bran, but by boiling the flour, and making it into what may be described as "billsticker's paste" made into a thin state, a much smaller quantity was necessary. That is to say, that by gelatinising the flour about 15 per cent. is required to achieve the same result, much depending upon the class of flour. The food value would be much the same as pollard and bran.

It should of course be understood that it is of inferior mechanical consistency to the usual mash.

Seasonable Reminders.

Active preparations should now be made for the coming hatching season. The first week in June should see the putting down of the first batches of eggs of the dual-purpose breeds, such as Orpingtons, Rhode Island Reds, Plymouth Rocks, and Wyandottes. True, eggs will not be plentiful, but those that are obtained will be the means of getting an early start, and it should be remembered that early chickens will always give the best returns for the feed supplied to them. The feed question will again obtrude itself in regard to the hatching season, and while not in the least under-estimating the difficulties that may be experienced in this regard, it will be wise for us not to take too pessimistic a view of the prospects. It may be taken into account that only a small amount of food is consumed by chickens up to the age of three months, and by the time the bulk of the season's chickens are of that age, we shall be nearing harvest time, and it must be admitted that the splendid rains that have fallen over a very large portion of the country make the prospects very much brighter than they were some weeks ago.

Agricultural Bureau of New South Wales.

NOTES COMPILED BY H. ROSS, Chief Inspector

Branch.	Honorary Secretary.
Albury	Mr. J. Brann, "Silvania," Racecourse Road, Albury.
Baan Baa	Mr. P. Gilbert, Baan Baa.
Balldale	Mr. H. Elrington, Balldale.
Bathurst	Mr J. McIntyre, Orton Park.
Batlow	Mr. L. S. Chandler, Batlow.
Beckom	Mr. Peter Grant, Beckom.
Blacktown	Mr. Robert H. Lalor, P.O , Seven Hills.
Bloom Hill (O'Connell) ...	Mr. C. A. McAlister, Bloom Hill, O'Connell.
Borambil	Mr. H. A. D. Crossman, "Homewood," Quirindi.
Bungalong	Mr. G. H. Pereira, "Springdale," Cowra Road, *viâ* Cowra.
Canadian	Mr. F. W. Taylor, Public School, Canadian Lead.
Cardiff	Mr. John Cockburn, Cardiff.
Carlingford	Mr. D. K. Otton, Carlingford.
Cattai	Mr. A. J. McDonald, Cattai, Pitt Town.
Cobbora	Mr. Robert Thomson, Cobbora.
Collie	Mr. C. J. Rowcliff, Cow Plain, Collie.
Coonabarabran	Mr. H. H. Moss, Coonabarabran.
Coradgery	Mr. J. Clatworthy, Beechmore, Millpose, Parkes.
Coraki	Mr. G. E. Ardill, Bungawalbyn.
Coreen-Burraja	Mr. N. B. Alston, Coreen, *viâ* Corowa.
Courangra	Mr. S. H. Warland, Courangra, *viâ* Brooklyn.
Cowra	Mr. E. P. Todhunter, Cowra.
Crudine	Mr. F. W. Clarke, Crudine.
Cundletown	Mr. S. A. Levick, Roseneath, Cundletown.
Cundumbul and Eurimbla	Mr. J. D. Berney, Eurimbla, *viâ* Cumnock.
Deniliquin	Mr. W. J. Adams, jun., Deniliquin.
Derrain	Mr. A. P. Hunter, Red Bank Creek, Matong.
Dubbo	Mr. T. A. Nicholas, Dubbo.
Dunedoo	Mr. V. A. Florance (*pro tem*), Dunedoo.
Erudgere	Mr. Frank Hughes, Erudgere.
Fairfield West	Mr. J. H Spargo, Hamilton Road, Fairfield.
Fernbrook	Mr. W. Marks, Yarrum Creek, Dorrigo.
Forest Creek	Mr. W. Thompson, Forest Creek, Frogmore.
Garra and Pinecliff ...	Mr. A. S. Blackwood, "Netherton," Garra, *viâ* Pinecliff.
Gerringong	Mr. J. Miller, Gerringong.
Grenfell	Mr. G. Cousins, Grenfell.
Gunning	Mr. E. H. Turner, Gunning.
Hay...	Mr. F. Headon, Booligal Road, Hay.
Henty	Mr L. Eulenstein, Henty.
Hillston	Mr. M. Knechtli, Hillston.
Inverell	Mr. W. A. Kook, Rock Mount, Inverell.
Jerrara	Mr. A. O. Lane, Public School, Mullengrove, Wheeo.
Jindabyne	Mr. Sylvester Kennedy, Jindabyne.
Katoomba	Mr. C. Wooller, Oliva Park Farm, Katoomba
Keepit, Manilla	Mr. J. B. Fitzgerald, Keepit, *viâ* Manilla.
Kellyville	Mr. Joseph Nutter, Kellyville.
Kenthurst	Mr. J. R. Jones, Kenthurst.
Lankey's Creek (Jingellic)	Mr. G. J. Nichols, P.O., Jingellic.
Leech's Gully	Mr. J. T. Weir, Tenterfield.
Leeton	Mr. C. Ledwidge, Farm 442, Leeton.
Little Plain	Mr. F. S. Stening, Little Plain, *viâ* Inverell.
Lower Portland	Mr. W. C. Gambrill, Lower Portland.
Mangrove Mountain ...	Mr. G. T. Hunt, Mangrove Mountain, *viâ* Gosford.
Martin's Creek	Mr. P. Laney, Martin's Creek, *viâ* Paterson.
Meadow Flat	Mr. F. J. Brown, "The Poplars," Meadow Flat, *viâ* Rydal.
Middle Dural	Mr. A. E. Best, "Elliceleigh," Middle Dural.
Milbrulong	Mr. O. Ludwig, Milbrulong.
Miller's Forest	Mr. A. J. O'Brien, Miller's Forest.
Mittagong	Mr. C. Dunlop, No. 7 Farm Home, Mittagong.

Branch.	Honorary Secretary.
Moruya	Mr. P. Flynn, Moruya.
Narellan	Mr. G J. Richardson, Narellan.
Narrandera	Mr. James Falkner, Narrandera.
Nelson's Plains	Mr. M. Cunningham, Nelson's Plains
New Italy	Mr. F. A. Morandini, New Italy.
Nimbin	Mr. J. T. Hutchinson, Nimbin.
Orangeville	Mr. C. Duck, Orangeville, The Oaks.
Orchard Hills (Penrith) ...	Mr. H. Basedow, Orchard Hills, *viâ* Penrith.
Parkesbourne	Mr. W. H. Weatherstone, Parkesbourne.
Peak Hill	Mr. A. B. Pettigrew, Peak Hill.
Penrose-Kareela	Mr. A. J. Bennett, "Brookvale," Kareela.
Ponto	Mr. A. D. Dunkley, Ponto.
Redbank	Mr. J. J. Cunningham, Redbank, Laggan.
Ringwood	Mr. Wm. Tait, Ringwood.
Robert's Creek	Mr. J. Cavanagh, Robert's Creek.
St. Mary's	Mr. W. Morris, Queen and Victoria Streets, St. Mary's.
Sackville	Mr. Arthur Manning, Sackville.
Sherwood	Mr. J. E. Davis, Sherwood.
Stockinbingal	Mr. J. Neville, Stockinbingal.
St. John's Park	Mr. J. O. Scott, St. John's Park.
Tallawang	Mr. Selwyn E. Hinder, Tallawang.
Tangmangaroo	Mr. A. Thompson, Public School, Kangiara Mines.
Taralga	Mr. Dave Mullaney, Stonequarry, Taralga.
Tatham	Mr. J. J. Riley, Tatham.
Temora	Mr. J. T. Warren, "Mortlake," Victoria-street, Temora.
Toronto	Mr. P. F. Newman, Toronto.
Tumbarumba	Mr. R. Livingstone, Tumbarumba.
United Peel River (Woolomin).	Mr. C. J. MacRae, Woolomin.
Upper Belmore River ...	Mr. A. W. Fowler, Upper Belmore River, *viâ* Gladstone, Macleay River.
Uralla	Mr. E. A. Neil, Uralla.
Valla	Mr. A. E. T. Reynolds, Valla, *viâ* Bowraville.
Wagga	Mr. Thos. Fraser, Aberfeldie, Wagga.
Walla Walla	Mr. B. A. Smith, Walla Walla.
Wallendbeen	Mr. W. J. Cartwright, Wallendbeen.
Walli	Mr. Geo. Edgerton, Applewood, Walli.
Wetherill Park	Mr. L. Rainbow, Wetherill Park.
Wollun	Mr. Robert Turner, Wollun.
Wolseley Park	Mr. H. McEachern, Wolseley Park.
Wyan	Mr. C. W. Harper, Myrtle Creek Railway Station.
Wyong	Mr. Edgar J. Johns, Wyong.
Yass	———
Yetholme	Mr. N. D. Graham, "Bona Dea," Yetholme.
Yurrunga and Avoca ...	Mr. W. H. Waters, Yurrunga.

Notice to Honorary Secretaries.

It is important that a record of the meetings of the branches should be inserted in the *Agricultural Gazette*, and honorary secretaries are invited to forward to the Department a short account of the proceedings of each meeting, with a brief summary of any paper which may have been read, and the discussion that followed it, as early as possible after each meeting. Notes for insertion in the *Agricultural Gazette* must reach the Department before the 16th to ensure insertion in the following month's issue.

Insect Pests.—Quite a number of the branches have availed themselves of the Department's offer to supply a set of insects, being the common pests of the district, and the collections are now being cased. The Government Entomologist suggests that as each district has certain pests peculiar to its orchards and gardens, more useful work would be done if the members themselves collected the local pests (orchard, garden, and stock) and sent them to the Department, where they would be arranged, mounted, a descriptive

label attached, and returned to the branch. Mr. Froggatt considers that such a collection would have a far greater value, as there would be more interest attached to the specimens when the members knew exactly where the pests came from, and where and how to find them.

Sheaves of Grasses.—The Department is prepared to supply to branches of the Bureau which make application through their secretaries, collections of sheaves of grasses considered suitable for the respective local conditions.

Organisation of Branches.

An officer (Mr. A. M. Makinson) has been appointed especially to attend to the needs of branches of the Agricultural Bureau, and generally to organise this movement.

He will visit in turn every branch throughout the State, and confer with the Secretaries and members as to future operations, &c.

Secretaries will be advised in due course when this officer will pay a visit to their respective districts.

Demonstrations in Clearing Land and Subsoiling with Explosives.

A limited number of demonstrations in clearing land and subsoiling with explosives will be given by Mr. C. W. Burrows, Assistant Inspector of Agriculture, to branches of the Agricultural Bureau. Branches who wish to take advantage of this offer are requested to make early application to the Department through their honorary secretaries.

Bee-keeping

A series of lectures on bee-keeping is being arranged by Mr. R. G. Warry, Instructor in Apiculture. Secretaries, whose branches intend availing themselves of this opportunity to receive a practical insight into this branch of agriculture, are requested to make early application.

REPORTS AND NOTICES FROM BRANCHES.

Albury.

A meeting of this branch was held on 13th April.

A request was received from the Department that the branch furnish a list of ten or twelve of the noxious weeds most prevalent in the locality, and a special meeting will be held for the consideration of the matter.

Mr. Makinson, Inspector of Agriculture, who was present, outlined the objects which the branch should keep in view. He congratulated the branch upon being the strongest in the State. It had 116 financial members. There were now ninety-nine branches working in the State, all of which had been formed during the past five years. The privileges of membership were that the assistance of experts was easily obtained, and the *Agricultural Gazette* and *Farmers' Bulletins* were supplied gratis. There was a prospect of forming several new branches in the neighbourhood of Albury.

The meeting decided that a conference of delegates from the various district branches should be held in Albury after the show.

A lecture on dairying was delivered before the branch by Mr. M. A. O'Callaghan, Dairy Expert, on 11th May.

There was a fair representation of farmers, and in his lecture Mr. O'Callaghan dealt with the present and future outlook for the industry, and suggested means whereby the district might be able to reconstitute the dairying industry on better lines after the drought had passed away.

Numerous questions were asked, especially dealing with the cultivation of crops on the river banks under irrigation, and the use of lucerne for dairy farming. Satisfactory information was given to those present on the points raised.

Beckom.

This branch has commenced operations again, and a number of new members have joined.

The next meeting has been set apart for a discussion on the noxious weeds of the district.

Blacktown.

The Secretary has furnished the Department with a list of the noxious weeds that abound more or less in the district, the first twelve of which are as follow:—Prickly Pear, Nut Grass, Sorrel, Cape Weed, Cobbler's Peg, Paddy's Lucerne, Ink Weed, Pig Weed, Potato Weed, Castor-oil Plant, Roley Poley, and Dock.

Bloom Hill (O'Connell).

The monthly meeting of this branch was held at O'Connell on 1st May. There was an attendance of fifteen members, representative of surrounding localities.

Pursuant to the request from the Department for information regarding local weeds, Mr. S. McKibbin, formerly secretary of the Bathurst branch, read a paper on "Weeds of the Bathurst District," and a lengthy discussion followed.

Canadian.

The circular from the Department of Agriculture, *re* weeds of the district, was discussed by members of this branch, at the March meeting, and members decided that the following were the worst weeds in their neighbourhood:—Wild Cloves, Mustard Weed, Chinese Burr, Saucy Jack, "Mother Gunther," Wild Hollyhock, Stinking Weed, Wild Tobacco, Marshmallow, and Horehound.

The regular monthly meeting was held on 24th April, when the principal business was a paper read by Mr. W Stageman on co-operative milling, which caused a deal of interest among members, because it so vitally affected them.

CO-OPERATIVE FLOUR MILLING.

The paper gave the experience of a farmers' co-operative mill in Eastern Gippsland, Victoria. The moderate capital required and the profits which would accrue to the farmer were two items that attracted notice. The method depended on a new system of treating wheat, which was destined to produce as great a revolution in the wheat and flour industries as had been wrought in the dairying industry. The plant was described as simple and compact. The "break" system was adopted, with the result that the finest quality of flour was obtained, and the bran and pollard were, as they should be, the offal of the wheat grain. The plant described could effectively treat 30,000 bags of wheat per year. Its total cost was £2,195. Every district producing 10,000 bags of wheat a year should have a plant. The gains that might be expected under the new system were stated to be: (*a*) 73 per cent. of highest grade flour from the wheat

milled; (*b*) 2,190 lb. of flour of superior quality from 50 bushels of wheat, together with 800 lb. of offal, and no waste; (*c*) great reduction in the selling costs. The above was compared with the average of the roller mill of the present day, which was given as follows: 2,000 lb. of flour, 900 lb offal, 100 lb waste; selling costs per ton, 6s.

Cardiff.

Mr. J. G. R. Bryant, Assistant Fruit Expert, gave a pruning demonstration in Mr. J. Hopkins' orchard on 22nd April. Upwards of fifty persons attended, and great interest was shown, and many questions were asked, and answered satisfactorily. The advice given by Mr. Bryant as to when and how to spray for the brown rot fungus, which played such havoc among the stone fruit last season, was much appreciated, and those present expressed their intention to follow the advice given.

It is the intention of members of this branch to co-operate, buying their spraying material in bulk, and there is a suggestion that the lime-sulphur solution should be made by the branch as a whole, and sold to each member as required.

A vote of thanks to Mr. Bryant for his remarks and lessons on pruning was unanimously accorded.

Members of this branch consider the following to be the worst weeds in the locality:—Sorrel, *Verbena officinalis*, Nut Grass, Water Couch, Couch Grass, Summer Grass, Fat Hen, Paddy's Lucerne, Cobbler's Peg, Stinking Roger, Chickweed, "Jump-up Jenny," Blackberry, Scotch Thistle.

Cobborah.

A branch of the Bureau was formed at Cobborah on 4th May. Twenty members were enrolled, and the undermentioned gentlemen were elected office bearers:—Chairman, Mr. M. Bourke; Vice-Chairmen, Messrs. J. H. Craft, J. J. Conliffe, J. W. Inder, and B. C. Cox; Hon. Secretary and Treasurer, Mr. Robert Thomson.

The subscription has been fixed at 1s. 6d. per annum per member.

Coradgery.

The April meeting of the Coradgery branch was held at the residence of Mr. Thomas Frecklington, "Rosedale." Mr. W. E. Tayler occupied the chair.

The Department of Agriculture wrote, stating that Mr. Bryant, Assistant Fruit Expert, would visit Coradgery on 9th July to give a demonstration in planting and pruning fruit trees.

Tho following paper was read by Mr. M. J. Kelk:—

Smut in Wheat.

At our last meeting, held at Adavale, members enjoyed a very interesting discussion on this subject, more particularly on the wisdom or otherwise of the practice, rather widely followed, of sowing wheat in a dry seed bed, without first having dressed it with some smut preventive.

Some members present said they had already followed this course, and as far as their experience went, it had proved a perfectly safe one. All the time-worn arguments were advanced, such as the immunity of self-sown crops, bleached seed, and even the "dark moon" theory. Fortunately, however, the meeting had the benefit of the presence of Mr. W. R. Birks, B.Sc., and when he had done with the subject members assuredly felt that the dark moon theory was just about as effective as any of the others.

There is no intention here to ridicule the ideas of farmers, gleaned in their efforts to grow wheat, not only with the best results, but with the least possible expenditure of both money and time; but it is felt that the educational value of Bureau meetings should be cultivated, and where doubts and misconceptions have existed as to any of the details of agricultural work, and these have been dispelled by a definite dictum of science—as in the present case—surely it is the function of this Bureau to record and emphasise the same, and not merely allow the fact but passing notice.

When Mr. Birks explained that what may, in lay terms, be described as the "seed of the smut" was a microscopic adhesion on the side of the grain of wheat, and that very little moisture was required to germinate this "seed of smut," the reason why self-grown crops and crops grown from bleached seed were immune became immediately and clearly apparent The reason why good coloured seed sown in a dry seed bed should be immune was, however, still left in obscurity, and why? Obviously, because it is not immune, as some farmers have discovered to their sorrow.

Members present were apparently unanimously decided that they at least would never in future take the risk, and it is to be hoped that the lesson learned that day—without the cost of bitter experience—will be acted upon and profited by the whole of the members of this branch.

An illustration used by Mr. Birks in emphasising his information may, perhaps, be repeated here. He invited us to imagine how much moisture would be required to germinate a cocoanut as compared with a grain of wheat, and assured us that the difference in size between the "smut seed" and the grain of wheat was much greater proportionately than that between the wheat and the cocoanut.

The only reason for adhesion to the belief in a supposed fact, now clearly proved to be a fallacy, can be a slight saving of time—the cost is practically nil—and if proper methods are employed the damage to the seed is inconsiderable.

The value of scientific knowledge has again been forcibly emphasised, and wherever the lay and the scientific opinion are in conflict farmers may with safety at least, and in most cases with advantage, yield to opinions formed and knowledge gained under circumstances denied to the ordinary farmer, be he ever so intelligent and enthusiastic.

Coraki.

At the monthly meeting, on 20th April, Mr. D. S. H. Moreton read the following paper:—

Poultry Farming on the Richmond River.

In most instances poultry farming in this district is carried on in a crude fashion, and with little profit to the farmer; but it can be made a profitable adjunct to dairy farming if properly carried out. Here you see female birds of all ages running together with male birds of all ages; and nests and houses of all descriptions and not too clean, though there are a few who recognise that there is money to be made, and that the fowls need systematic attention. To profitably run poultry it is necessary to get the best of the breed or breeds that you intend to keep, and to see that they are properly housed and fed, and that the houses are kept clean. I would strongly advise proper feeding, cleanliness, breeding from selected birds, selling off the 3-year-old hens, separation of all male birds, and the regular marketing of eggs. I find even at the present time some people have the idea that it is necessary to keep male birds with the flock to obtain eggs, whereas it is better to have no male birds with the layers.

On a farm where there is so much produced that can be used for feeding the fowls, a good profit can be made. Skimmed and thick milk are useful foods, and any calves that are killed should be boiled for the fowls, as these will greatly assist the egg production. Cool, clean water, grit, and green food are essential, and meat food is also beneficial.

Farmers should not breed indiscriminately from their flocks, but should pick out a sufficient number and pen them up, with the number of males required to ensure fertility of the eggs, and breed only from these birds. The best months for hatching are July, August, and September. When chickens are far enough advanced to distinguish the sex, the cockerels should be shut away by themselves until marketed. I would advise farmers to sell off all their old hens and all male birds, get a pen of some good breed or breeds, and raise the chickens only from those birds. The following year there would be sufficient birds to breed a large flock from. Careful reading of the poultry notes in the *Agricultural Gazette* and any other reliable papers that are available is recommended.

At the present time feed is dear, but it will not always be so, and the farmer who keeps his farm well stocked will reap the benefit, for many poultry farms have considerably reduced their flocks.

That poultry farming is profitable is borne out by the figures of the Grafton Laying Competition for 1913-14, when 204 birds laid 38,796 eggs, or an average of 190 eggs per hen. The total cost of feeding these hens was £70 11s. 3d., or an average of 6s. 11d. per hen for twelve months. The eggs were sold through Sussex-street merchants, and after deducting shipping, cartage, and selling charges, returned £180 15s. 10d., or an average of 17s. 8d. per hen for twelve months. The difference between cost of feeding and the net returns was £110 4s. 7d., or 10s. 9d. per hen for the twelve months The winning pen of 6 hens laid £7 1s. 10d. worth of eggs, and after deducting cost of feed, £2 1s. 6d., they showed a profit of 16s. 8⅔d. per hen for the twelve months.

I would add that to be a successful egg farmer it is necessary to keep the male birds away from the flock of layers so that the eggs will be infertile. Fertile eggs very quickly go bad in warm weather, whereas eggs that are not fertile will keep for a much longer period. This marketing of fertile eggs that are not gathered regularly is the greatest obstacle to the sale of eggs from this district.

If the following rules are observed the farmer's name will become known to the regular buyers, and will always command a good price without question, but they should never be departed from, as confidence once lost is hard to regain:—

(1.) Market infertile eggs as far as practicable.
(2.) Gather the eggs daily.
(3.) If a nest of eggs is found do not send them to market.
(4.) Always keep the eggs in a cool place.
(5.) Never send dirty or cracked eggs to market.
(6.) Grade the eggs.
(7.) Market the eggs at least once a week.

Cundumbul and Eurimbla.

This branch held its first picnic on 5th April, when almost all the members attended, as well as a number of residents of surrounding centres. It was by far the largest gathering ever seen at such a function in the locality, and was an entire success.

The monthly meeting was held the same evening, and was well attended. It was decided to discuss the matter of weeds, as requested by the Department, at next meeting.

Members greatly appreciated the sheaves of wheat, oats, &c., supplied by the Department.

Mr. T. M. Berney contributed the following paper:—

To get rid of Black Oats.

To get rid of black oats my method is to cut the infested crop as soon as it shoots out, stook it up, dry, and cart in. Then turn sheep in on the stubble till the oats are well eaten out, put the one-way disc or spring-tooth cultivator into it, and run a light harrow over it. If the ground is lumpy, a light roller is very good to break the lumps and form a good seed bed. The main thing is to encourage the seed to germinate. When there is a good green coat of oats on the ground, turn the sheep in and feed off again. It is not advisable to sow the next crop too early; about the middle of May is early enough. The mould-board plough is the best to use, as it turns the surface down and stops any stray oat seeds from growing. If the season is too dry to make the oats shoot, it is better to leave the paddock out through the winter, and prepare it well for the next sowing.

Discussion.—Members generally agreed with the paper. Some added that they obtained a comparatively clean crop by turning the seed down, ploughing deeply, and sowing immediately with wheat, but the practice was not unanimously recommended, as it was considered that next season the oats would be turned up, and the land would be as much infested as ever.

Kellyville.

At the May meeting of this branch there was a good attendance of members.

A discussion took place on the worst weeds of the district. It was decided to continue the discussion at the next meeting, and members were invited to bring specimens of what they considered the worst weeds in their respective neighbourhoods.

Leech's Gully.

The monthly meeting of this branch was held on 26th April. There was a good attendance of members, Mr. A. Mansfield presiding.

A letter was received from the Queensland Fruit-growers' Association suggesting that a fruit-growers' conference be held in Tenterfield at an early date, with a view to inaugurating a strong co-operative movement between the growers of Tenterfield and Southern Queensland. It was decided to meet the delegates as requested.

Messrs. A. Holly, G. R. Smith, R. J. Walker, and the Chairman were appointed to act as judges in connection with the Boys' Maize Plot competition.

Members discussed the question of noxious weeds in the district, and the following list has been supplied to the Department as the twelve worst that farmers have to contend with:—Water Couch, Sorrel, Nut Grass, Castor Oil Plant, Red Root, Bathurst Burr, Star Thistle, Vervane, Sweet Briar, Blackberry, Stunted Grasstree, and Wire Grass.

Leeton.

Mr. A. M. Makinson, Inspector of Agriculture, attended a meeting of this branch on 27th April, with the object of increasing interest in the Agricultural Bureau.

Mr. Makinson said he had been around the area, and had seen some very fine properties, which might be an object lesson to growers in other areas where better facilities were available. The Department wished to work through the Bureau to help the settlers. The branch should be the best in the State, because it was much easier for members to get together. Even those with good properties had a great deal to learn. Knowledge was required as to water and its effects on the soil, and the various kinds of fruit to grow to suit the market. On account of the water, the income should be surer, but more money had to be spent to get a profit than in any other rural industry. The spending of that money was important, because it was so easy to waste it. Beyond what they could learn from the officers and from each other, there was a big field for co-operation amongst themselves. He dwelt on the benefits of co-operation, and said that the success of Mildura was due to it. He gave some particulars with regard to the Dried Fruits' Association, and advised settlers to either fall in line or form an association of their own The next thing was what the settler was going to plant, and in that connection they must consider what could be profitably marketed. There were some fruits they could plant, such as navel oranges, but they must co-operate on general planting, so as to avoid having to root up trees when they came into bearing, as had been done in Mildura and other places.

A discussion took place as to a series of lectures on various subjects, and a committee was appointed to prepare a syllabus. It was agreed to ask the Department to arrange for a demonstration on pruning and spraying, also a lecture, at the earliest opportunity.

A further meeting of the above branch was held on 10th May for the purpose of receiving the secretary's report and the balance sheet, and also for the election of officers.

The report disclosed that only three regular meetings had been held during the year 1914, and three officers of the Department of Agriculture had delivered lectures respectively on viticulture, poultry, and entomology.

The balance sheet showed a cash credit balance of £2 14s. 6d. on the year's transactions.

The following office bearers were elected:—Chairman, Mr. J. S. Oag; Vice-Chairman, Mr. R. H. Stewart; Treasurer, Mr. G. Arbuckle. The appointment of secretary was held over until next meeting.

Lower Portland.

A paper was read by Mr. W. R. Newell at the meeting, held on 29th March, of the Lower Portland branch.

Manures and Manuring.

The value of manures properly applied to all kinds of fruit trees is great, but many orchardists either doubt their efficiency or do not understand their uses. If the fruit-grower wishes to produce full crops of good fruit, manures are sooner or later absolutely necessary on every class of soil. The flats of the Hawkesbury and Colo Rivers are able without assistance to provide with sufficient rapidity sufficient plant food for the support of heavy crops, which every orchardist requires. The poorer soils from the time the trees are planted are found to be deficient in plant food, and in nine cases out of ten the trees are left to shift for themselves, with dire results. Crops from these trees are of a very moderate quality, whereas if the soil had been treated with manures suitable to their kind, crops would be produced which would compare favourably with those grown on the richest soils. The application of manures greatly increases the fibrous roots, and the tree is rendered better able to withstand the droughts or to resist fungus growths that are generally found upon trees that are neglected and starved. Although the tree that is manured for the first time shows a great improvement in appearance, it does not derive the full benefit until the following year. This I have proved beyond a doubt. What the trees require is a complete manure, and the following constituents are essential:—First, potash; second, phosphoric acid; third, nitrogen. Potash is usually regarded as giving colour, a better yield, better quality and flavour, and increasing the size and keeping qualities of the fruit, and also as giving greater resistance to diseases. Phosphates increase the root system especially, help to mature the fruit early, and also assist potash to give the best results. The best nitrogenous manure is sulphate of ammonia. I prefer bone phosphate and blood with the sulphate of potash added, as the blood and bone have two constituents only, viz., nitrogen and phosphoric acid. When adding the sulphate of potash, be sure to mix thoroughly before sowing, otherwise it will not have the desired effect. There are several mixed manures on the market. The best time for sowing these manures is, in my opinion, the autumn or early spring. This gives the manure time to be dissolved by the rains we generally get at that time of the year. The quantity of manure required depends entirely upon the age and size of the trees. Some orchardists sow the manure broadcast among the trees. I do not like this method, and always sow close around the trunk, thus obtaining the quickest results from any showers of rain that fall; the ground around the trunk of the tree gets more water (as it runs down the branches) than does that between the trees. Especially is this true in the case of light showers.

The benefits derived from a good supply of organic matter are an abundance of humus and capacity for retaining moisture. It is, therefore, necessary to add plenty of farm-yard manure or green manure, whichever is available. It will be found that by having the land well supplied with humus, better results are obtained from artificial manures, for without humus they have little effect.

A pruning demonstration was given at Lower Portland on 15th April by Mr. J. G. R. Bryant, Assistant Fruit Expert. The demonstration took place in Messrs. J. J. Herp's and R. Lowe's orchards, and was well attended, a keen interest being taken in the work.

PRUNING DEMONSTRATION.

It may be said that Mr. Bryant has pruned the same trees for three years in succession, chiefly with the object of finding out in a practical way the methods of pruning most suited to the district. In the first place the trees were cut hard back, but this method, it is plainly evident, is not suitable here, owing to the strong soil making the trees more vigorous. Consequently, the trees make much surplus growth, and this does not sufficiently increase the quantity and quality of the fruit, and also imposes extra pruning next season, which item, especially in large orchards, is a consideration. This year Mr. Bryant plainly pointed out this fact, and pruned in a more moderate manner, explaining the reason for not cutting back so hard.

The varieties of trees pruned were pears, apples, peaches, plums, and apricots. During the demonstration, much discussion took place regarding the best varieties of stone fruit for the district, the lecturer recommending the early varieties, which certainly give the best results here.

The subject of spraying also proved very popular. Mr. Bryant urged growers to be more diligent in this respect, for each year the various pest diseases and scale insects were becoming more prevalent and serious, but in cases where due precautions had been taken—that is, spraying for stone fruit and chiefly fumigating for citrus trees—the difference was very evident. Touching fumigation, Mr. Bryant emphasised the value of this method of eradicating scale pests on citrus trees, as it is impossible for anything to be missed inside the tents where a reasonable amount of care has been exercised. To demonstrate this fact, a visit was made to the mandarin trees that were fumigated in Mr. R. Lowe's orchard during Mr. Bryant's last visit to Lower Portland. These trees (four in number), before they were fumigated, were very badly affected with Red Scale, and were treated with the quantities of cyanide and acid recommended in No. 2 chart. This year the trees were carrying a good crop of fruit, were quite clean, and were in a very healthy and vigorous condition.

A large number of growers assembled on the following evening, 16th April, when Mr. Bryant gave a lengthy address on the fruit question, dealing chiefly with the fruit pests and their eradication. During the address many questions were answered by the expert.

Following the addresses a social hour or two was indulged in, the ladies having provided light refreshments, which, in conjunction with the singing, games, and dancing, resulted in a pleasant combination of instruction and enjoyment.

The monthly meeting was held on 27th April, the principal business being a discussion in connection with the weeds of the district. The members of the branch have agreed to collect and forward specimens of local weeds to the Department, giving, as far as possible, the local names, habits, and methods of eradication.

Two new members were added to the list.

Meadow Flat.

The annual meeting of this branch was held on 8th May, Mr. T. L. Williams being in the chair. The election of office-bearers resulted as follows:—Chairman, Mr. T. L. Williams; Vice-Chairmen, Messrs. John Murray and J. Macrae; Hon. Secretary and Treasurer, Mr. Fred. J. Brown.

A discussion on weeds of the district will take place at next meeting.

Middle Dural.

In connection with the request of the Department of Agriculture for information *re* local weeds, the Secretary of this branch advises that members instructed him to state that the different weeds in the district are used for green manure, and that there are no noxious weeds in the district.

A paper, from which the following extracts are taken, was read by Mr. Arthur E. Best, Hon. Secretary of this branch, at the meeting held on 30th April.

EXPERIENCES WITH POULTRY.

I have come to the conclusion that poultry, run in connection with an orchard, is a very good side line, amply paying for itself and leaving a small margin to spare. Besides reaping an egg crop, you have, or should have, from every twenty-five head of fowls 2 cwt. of manure per month, which in twelve months is a considerable help with young trees, seeing that with two-year-old trees about four shovelfuls of manure is a good supply.

In feeding the breeding pen I use half-pint bran, one pint pollard, quarter-pint dried blood and bone, and a little salt for the morning mash. This is mixed neither too dry nor too wet. At midday a liberal supply of green feed is put in, a small patch of kale being grown for the purpose in case the summer should be dry, and there should be no green stuff in the orchard. The evening meal consists of half-pint corn and one pint wheat. Plenty of clean cool water should always be before the fowls. For this I use a kerosene tin cut in halves, placing one half in a case set on its end, with the lid removed and the opening facing south. This keeps the water nice and cool, and prevents dirt and rubbish getting into the water. The hens should have a fair-sized pen so that they will have plenty of exercise, but they must not be overfed or else they will become too fat and the chickens will be weak. Oyster shell and broken crockery or shell grit should always be in the pen. For this I place in the pen a flat box—6 inches x 12 inches—with a piece of 4-inch wire-netting over the top. This prevents the hens from scratching it out and wasting it.

When the eggs are collected for hatching they should be placed in a flat box with the small end up, and if you wish to keep them over a week, turn the box over once a day, and keep them in a moderately cool place. I do not think it is advisable to wash the eggs intended for setting; the dirt should be rubbed off if there is any on them.

After many trials with the hen as a hatcher, and with sad disappointments, I have concluded that the artificial incubator is far the best; there is greater certainty about the chickens, and when they are hatched there is no trouble with vermin. For the room, 6 feet x 4 feet and 5 feet 6 inches high, with a solid ground floor, is the most economical; 22 feet of 3 x 2, 22 6-feet palings, and a roll of 15 feet of some roofing material, will make the required room. To ensure a steady temperature and prevent the walls from attracting the heat of the sun, the following solution is invaluable:—Six parts stone lime, two parts coarse salt, and one part alum. Slack the lime; dissolve the salt and alum in hot water, and add to the lime. When properly made this should have the consistency of paint. Put three coats of this on the walls, allowing a day between each coat of solution. It will last for years, and will not rub or wash off. On one occasion I turned the eggs on Saturday at midday, and did not return until Sunday at 9 p.m.; as I got 35 chicks out of 40 fertile eggs, I think this result speaks well for both machine and room. I may state that I only see my machine once a day, viz., 8 p.m., when I turn the eggs.

During the first week the food I use consists wholly of rolled oats, but this should not be fed in a way that it will sour. I find that it should be crumbled a bit, and sprinkled over the run for the first two days. After that I place it in a trough specially made of galvanised iron, with bars of wire looped over the top, and soldered on each side. This is also a good idea for the water, as it prevents the chicks from getting into the water and keeps it clean.

My mixture for the chicks is one pint finely cracked maize, half-pint cracked wheat, half-pint linseed meal, half-pint coarse bran, half-pint rolled oats, half-pint sea shell grit, one pint lucerne dust, quarter-pint salt. This has proved very good with my little flock, and twice a week I give them one teaspoonful of Epsom salts to a pint of fresh cold water. A rough shed should be supplied for them also, so that as the chicks get older they can be put there to look a little after themselves. In this I place some stable manure, leaves, short grass, &c., and it is wonderful how the chicks thrive. Especially during the hot sultry weather should this be supplied; they have the shelter, also the ventilation, and room for exercise. I think this very essential for allowing the young chicks to run in.

As soon as I can discern which are cockerels I pen them off, and feed for the morning meal—three parts pollard and one part oilcake; maize at midday, or, if it is available, thick milk instead; then maize again at night. A little green stuff should be supplied for them to pick at during the day.

Mittagong.

The monthly meeting was held on 29th April, Mr. J. V. Connolly in the chair.

Mr. W. S. Cooke tendered his resignation from the position of Hon. Secretary, and Mr. Charles Dunlop was elected as his successor. In passing a vote of thanks to Mr. Cooke for past services, regret was expressed that he was forced to resign owing to unavoidable circumstances.

It was decided that the regular meeting of the branch should be held the first Thursday evening each month.

A discussion took place on the drawbacks caused to farmers in the district by several weeds that were very difficult to check. The following were mentioned as being the worst in this locality:—Sorrel, Cape Weed, Spurrey, Stagger Weed, Dock and Wire Weed.

Moruya.

At a well attended meeting on 30th April, a discussion was held on noxious weeds prevalent in the district, and they were classed in the following order:—Blackberry, Bathurst Burr, Star Thistle, Variegated Thistle, Burrawang, Ink Weed, Bergalia Tussock, Nut Grass, Cape Weed, May Weed, and Prince of Wales' Feather.

Narrandera.

The monthly meeting of the above was held on 1st May

The financial statement showed that the amount in hand was £1 5s., and the liabilities 7s.

It was resolved to discuss the subject of the noxious weeds of the district at next meeting, and members were asked to make a note of the weeds which they considered most injurious from the agriculturist's point of view.

Mr. Russell asked if any of the members had had trouble this year with worms in horses. He described the death of one of his horses, which on being opened up, was full of worms.

The Secretary said that he had not yet heard much about worms in horses this year, but it was probable that there would be trouble owing to the dry feeding of stock. He had had good results with drenches composed of 1½ oz. of turpentine and 1 pint of raw linseed oil.

Nelson's Plains.

A lengthy report has been received from the Secretary of this branch, in response to the request of this Department for information regarding the worst weeds of the district and the methods adopted to eradicate same.

Nimbin.

Pursuant to the request of the Department for information regarding noxious weeds of the district, the Secretary of this branch advises that since paspalum has obtained such a hold on the Richmond River, many weeds which were once a pest now give very little trouble. The following are still nuisances, however:—Nut Grass, Ngoora Burr, Lantana, and Prince of Wales' Feather.

At a meeting held on 24th April an interesting discussion took place on maize growing.

MAIZE GROWING.

Mr. Geo. Eaton showed samples of Early Leaming, Improved Yellow Dent, and Early American Wonder. He stated that the last-named had proved a splendid yielder. In four months and a few days after planting he had the crop in the barn. He contended that it did not pay to grow Leaming when it was possible to get such good results from this new variety. He had been trying it for some time. In both Early American Wonder and Improved Yellow Dent he had found that very many heavy cobs grew high up on the stalk and were more likely to get blown over, so in gathering cobs for seed he took a bag and went through the rows, picking the best cobs he could find that were growing low down on the stalk. As a result, this season he had succeeded in bringing down the average height of the cobs by about 2 feet, the stalk above being thinner, thus allowing more nutriment to go into the cobs. He had grown a good crop of artichokes between the rows at the same time.

Mr. Eaton said he was also experimenting with a white corn which stooled out after coming up, and he got sixteen small cobs from one seed planted in each hole. His method was to plant two seeds in each hole, and if both came up one was removed.

Orchard Hills.

Members of this branch, at their last meeting, gave special attention to the circular issued by the Department of Agriculture calling for information regarding the worst weeds of the district. Some members were of the opinion that Couch Grass is not a weed; others considered it the worst weed to contend with. The Secretary has furnished the following list of the twelve worst weeds of the locality:—Balm or Stagger Weed, Three Corner, Fat Hen, Black Thistle, Paddy's Lucerne, Summer Grass, Wire Weed, Cape Weed, Nut Grass, Bathurst Burr, Sorrel, and Castor-oil Plant.

Penrose-Kareela.

The Secretary advises that the following are the weeds most prevalent in the district in order of seriousness:—Sorrel, Couch Grass, Bracken, Blackberry, Fat Hen, Summer Grass, and Cape Weed.

Robert's Creek.

A party of between fifteen and twenty members of this branch visited Grafton Experiment Farm on Thursday, 15th April.

Sackville.

Members of this branch were deeply interested in a discussion, which took place at their last meeting, regarding the weeds of the district. The Secretary reports that members considered the following to be the worst in the district:—Nut Grass, Reeds, Summer Grass, Cat or Fox Tail, Stinking Roger, Couch Grass, Paddy's Lucerne, Scotch Thistle, Purple Top, and Cobbler's Peg.

St. John's Park.

Twenty-five ladies and gentlemen, members of this branch, visited Hawkesbury Agricultural College on 25th March, and all speak highly of the treatment afforded them by the various officials. Mr. Hadlington was deluged with questions during the inspection of the poultry section. Poultry farmers desiring to become efficient in their line of business would do well to organise in parties, and have a day at the College with the Poultry Expert.

The annual meeting was held on 24th April. Owing to bad weather the attendance was small, and the election of officers for the ensuing year was held

over till next meeting. The Secretary reported that there were 43 financial members on 31st March, and the balance sheet showed a credit of £3 15s. 3d.

Twelve meetings were held during the past financial year; the usual monthly meetings are held on the third Saturday night in the month.

Tallawang.

The regular monthly meeting of the above branch was held on 25th April. Mr. G. Lincoln, junr., resigned the secretaryship, and Mr. Selwyn E. Hinder was appointed his successor.

Correspondence from the Department was read, replying to an inquiry by the branch, relative to the sowing of wheat in a dry seed bed with superphosphate; in such cases the Department recommended 40 lb. superphosphate per acre.

After a short discussion on the weeds of the district, it was decided to send a list of eight to the Department as being the worst, viz.:—Black Oats, Thistles (Scotch, Chinese, &c.), Cobbler's Peg, Wild Clover, Horehound, Paddy Melon, "Mrs. Gunther," and Bathurst Burr.

An interesting reading from a standard veterinary work was adopted as the subject for discussion at the above meeting. Three common troubles—sand crack, prick or stab, and corns—were dealt with, and it is proposed to discuss colic at the next meeting.

Toronto.

At the May meeting members of this branch discussed the list of weeds prevalent in the district, and after a lengthy conversation it was decided to furnish the following list to the Department of Agriculture, in response to the request for the names of the worst weeds in the locality:—Pig Nut or Chain Grass, Blackberry Vine, Paddy's Lucerne or Iron Weed, Sorrel, Batchelor's Button (yellow flower), Black Thistle, Square Weed, Stinking Roger, Convolvulus, Reeds, Smart Weed, Cobbler's Peg, Primrose, Castor-oil Plant, and Blackthorn (scrub).

United Peel River.

Noxious weeds and the means of eradication were discussed at the meeting held on 1st May. Appended is a list of the weeds considered by members to be the worst in the district:—Bathurst Burr, Ngoora Burr, Castor oil, Mexican Thistle, Nut Grass, Stinkwort, Blue Weed, Star Thistle, Black Thistle, Fat Hen, Cat-head, Wire Weed and Boggabri.

The first eight mentioned are considered by members to be the worst weeds in the district in that order. The last five are not regarded as bad weeds, as they are fair feed for stock.

Wollun.

The usual monthly meeting of the above branch was held on 1st May.

The matter of weeds was discussed, and the following list was approved for transmission to the Department:—Blackberry, Black Thistle, Darling Pea, Boggabri, and Sorrel.

It was decided not to hold the annual sports, but instead to use every means to make a success of the local effort in aid of the Belgian Fund.

Orchard Notes.

JUNE.

W. J. ALLEN.

Choosing Varieties of Fruits to Plant.

To select the varieties of fruit suitable for planting requires careful thought and investigation. The district in which the orchard is being set out, the land, and the markets to be supplied, all have to be taken into consideration. The intending planter should be guided by the experience of successful men in the district where it is intended to commence, and the fruit merchant should also be consulted.

The Department is at all times willing to assist in this direction. Farmer's Bulletin No. 83 gives information along this line, and copies may be had upon application. In writing to the Department for advice on this very important matter, it is as well to furnish precise particulars as to locality, aspect, nature of soil, subsoil, distance from train or boat, and any other details that might assist in the making of a recommendation.

Harvesting.

The busy season for the citrus grower is commencing. Main crops—oranges and lemons—will be ready for picking. Care should be exercised to grade and pack the fruit properly when forwarding to market. It should be placed in the cases in diagonal rows. This insures that it shall carry in the best manner.

Planting.

Where deciduous fruit-trees or vines are to be planted this season, it is best to start the work as early as possible, whether it be for refills in an established orchard or for the planting of a new one. The sooner now that any planting is finished the better will be the early root growth, as the roots start to throw out new growth in July. If the soil is dry, however, it would be better to defer the planting until after more rain falls; but wherever there is sufficient moisture, this work should be pushed on to completion.

For stone fruits, peaches, plums, cherries, &c., one-year-old trees should be planted. Apples and pears may be two years old, although one-year-old trees are preferable.

The stock or root system used for the young trees is a very important point in connection with the purchasing of nursery stock. Peaches, for instance, prefer their own seedlings. Plums are usually worked on Marianna plum for light soils, and on Myrobolan for heavy soils. In some soils, however, the peach stock suits best. In the case of apples, blight-proof stock must be

used. For this purpose, Northern Spy and Winter Majetin are most frequently used, while Carrington and Allsops are often employed for this purpose on the coast. Pears are mostly worked on pear seedlings. For small orchards, and where a few trees are required, the quince is a good stock for the pear. It can be seen that it is necessary to make full enquiries when purchasing young trees for planting an orchard.

Pruning.

In large orchards, pruning may be pushed on with this month; but in smaller ones there is no hurry until July. This important work should not be neglected if growers wish to get the best results. Judicious summer thinning, combined with the necessary winter pruning, will repay the grower handsomely for the labour incurred.

Growers would do well to procure the latest publications in connection with pruning. New ideas and improved methods are constantly being brought forward, and information gleaned in this way may be of considerable service. The handbook on "Pruning," issued by the Department, has again been revised, and in all probability will be available at the Government Printing Office early this month. Price, posted, 1s. 1d.

Fruit Fly.

In citrus orchards kerosene traps should be in use, as advised last month, to minimise the ravages of this pest. Windfalls and infected fruit should be regularly destroyed by either boiling or burning.

Weak Trees.

Mark all weak and diseased trees when pruning, so that they can receive special treatment. This is a most important point in connection with the management of an orchard. Weak trees mean poor quality fruit, so that they should be supplied with either new soil or with stable, sheep, or farmyard manure.

Diseased trees must have extra attention in the way of spraying. Two or more applications may be necessary. At this season of the year spraying may be applied at full winter strength.

Improvements.

During this month rainy days will, no doubt, be experienced. This should not mean an idle time. Harness, tools, implements, &c., should all be cleaned, oiled, repaired, or painted. Gates and fences should receive attention, as well as buildings. Odd jobs of this kind should never be neglected.

A good winter job is the making up of fruit cases from shooks, and also repairing and dipping old ones in readiness for packing.

Apiary Notes.

June.

R. G. WARRY, Demonstrator in Apiculture.

The Winter Feeding of Bees.

THE season for beekeeping now just closing can be numbered amongst the poorest on record. Honey is so scarce in Sydney that consignments of inferior and rank honey which, during average years are difficult to dispose of at 1d. to 1½d. per lb., are now selling at 3d.; while beeswax has reached 1s. 6d. per lb. wholesale. But besides a scarcity of honey for sale, there will be in some apiaries a shortage of stores for winter use. Wherever this is the case, stores can be given by feeding. The feeding of bees is mainly carried out for one of two reasons, either supplying winter stores or stimulating brood rearing in early spring. The feeding of bees at this time of year should have been avoided by leaving the colonies sufficient stores (about 30 lb. in each) at the end of the last flow of honey, but in many districts this season this flow was very poor, and what it supplied for winter use will have been used up by now.

In our coastal districts brood-rearing generally goes on slowly all through the winter; it ceases for a time only in the coldest parts of the State. It will be found, during the few weeks when bees are inactive and brood-rearing has ceased, that very little food is used, but that when activity and brood-rearing begin again, feed will be used up much more quickly.

Feeders Used.

The "Miller" feeder answers the purpose well for winter feeding, as it is placed directly over the brood cluster, and can be charged with from 20 to 25 lb. of feed at once, giving all that is required in one operation. This is preferable to opening the hives frequently during winter months for the purpose of charging smaller feeders.

"Alexander" feeders, running under the brood combs at the back of the hive, can be used for winter feeding, but as they only hold about one-third of what the Miller feeder contains, they are not so well adapted to the work. But wherever Alexander feeders are attached to hives of bees they can be used, as the Miller feeder is not so much better that it would be worth while making the change.

A useful feeder is to be found in a sound empty comb; this can be filled with syrup by laying it in a basin or a shallow pan and allowing the syrup to run through a strainer held about 9 inches above the comb. The syrup, falling like rain, fills the empty cells in the comb, and the latter can then be hung up to drip for a while and afterwards placed in the hive close to the

brood cluster. Two combs filled in this way can be given to a colony at once, placing one at each side of the brood cluster and renewing them when empty.

The "Doolittle division-board feeder" can also be used; this is simply a frame of the same size as the brood frames in use, with a thin board nailed on each side of it, making a box the same size as the frame, the inside being coated with wax. This feeder hangs in the brood chamber in the same way as a brood frame. It should be filled nearly to the top with syrup and some light stuff such as shavings, or chips of wood should be floated on the surface of the feed to prevent the bees drowning. This feeder, like the Alexander, is better adapted to spring feeding, but where it has been already purchased it can be used for winter feeding.

Syrup for Feeding.

Syrup for feeding can be made from honey, but the greatest care should be taken to ensure that the honey used in feeding has been extracted from colonies free from disease. Foul brood has many times been communicated to clean apiaries through the use of honey from diseased colonies. Equal parts of honey and warm water, stirred together, make a thin syrup which can be used for winter feed if the weather is bright and dry, but if the weather is damp and cold the syrup is better made of one and a half parts of honey to one part of water.

If honey from a clean source is not available, sugar can be substituted in the syrup. Many bee farmers prefer sugar syrup to honey and water; it is certainly quite as good. For winter feed make the syrup by mixing equal parts by bulk of white sugar and hot water until the sugar is dissolved, then stir in half a measure of sugar to each measure of water used; if the extra sugar added does not melt readily, heat the whole, and stir until the syrup is formed.

When making sugar syrup avoid brown sugar, as it is likely to produce dysentery in the colony. The brands known as No. 3 are the cheapest of the white sugars that can be safely used.

An English View of Weeds.

1. *They take up the space required for our crops.*—It is obvious that, say, a carrot or any other useful plant cannot grow where the gentle chickweed or any other useless plant grows.

2. *They rob our crops of water, plant food, light, air, and warmth.*—Most plants are about three-fourths water. Water, together with sunlight and the chlorophyll ("Leaf-green"), is carrying on all the processes of plant life, and building up the plant. Without water the root hairs cannot take up plant food from the soil. As soon as the rapid growing weeds prevent our plant from enjoying its place in the sun its progress is arrested, and its chance of reaching the stage of usefulness is gone.

3. *Weeds hinder cultivation.*—A field or garden foul with weeds is hard and expensive to cultivate (whether the expense is in cash for another man's labour and needless wear and tear of horses and implements, or in waste of our own energy).

4. *Many weeds are in alliance with certain insect and fungus enemies.*—They act as hosts to them while our crops, which they are going to attack, are growing.

5. *Some weeds have become parasitic*, that is to say, they have even discontinued their previous habit of a separate establishment, but live shamelessly on the useful plant itself. The most destructive weed of this kind is dodder, which attaches itself to a clover plant, feeds on its substance, and sends out tendrils to other clover plants, until at last the whole field is devoured, and looks as if a fire had raged over it.

6. *Some weeds cause loss by poisoning stock.* More deplorable still, the death of many children is caused by the accidental eating of poisonous berries.

7. *A minor charge is the loss caused to dairy farmers by tainted milk* due to the cow having eaten garlic or chamomile.

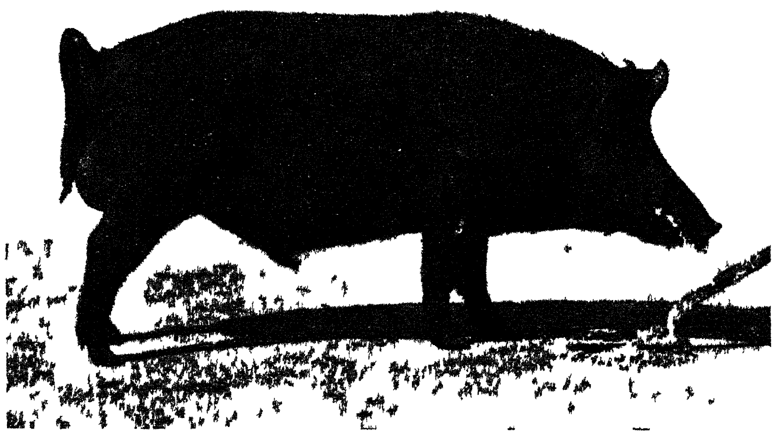
8. *Some of our enemies*—the bindweeds—*attack fruit bushes, corn crops, and garden plants, and drag them down.* Sometimes entire fields are ruined in this way.

9. On soils which have been drained considerable *loss is caused by the drains being stopped up by weeds.*

10. Finally, there is the financial *loss caused by weed seeds being sold*—ignorantly or unscrupulously—*with farm seeds.* A fairly average sample of seeds bought from merchants is one with an 80 per cent. purity; that is to say, only 80 per cent. are seeds of the crop we wish to grow, 20 per cent. are weeds or "duds." In terms of £ s. d., in every £5 the farmer pays for seed he loses 20s.

In addition, there is the loss of labour bestowed on tilling part of his soil for weeks, the loss of proportion of rent, the loss of manure, the extra cost of harvesting, and the expenses caused by the consequences of having harvested a foul crop. If it is threshed, both seed and straw fetch poor prices, being spoiled by the weed seeds and stalks. If it is fed to stock, the seed may pass back to the field in the dung; and the straw is less palatable because of the weeds in it.—Farmer Giles in "War on Weeds."

PIGS FOR SALE
AT
Hawkesbury Agricultural College.



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PEDIGREE.

SIRE	**Cholderton Golden Duke of Great Britain (imp.).** Bred by H. C. Stephens, Esq.	**Duke of Gloucester (N.B. 12177).** Bred by Lord Sherborne.
		Cholderton Golden Jewel (N.B. 24282). Bred by H. C. Stephens, Esq.
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Price £20, delivered in strong shipping crate at any Port or Railway Station in N.S.W. (except on the North Coast, where delivery is made at Ports only), or at any Interstate Port.

This Boar is in excellent breeding condition and has proved himself to be a SURE STOCK-GETTER. His Progeny are noted for QUICK GROWTH, EASY FEEDING PROPENSITY, STRONG CONSTITUTION, and HIGH QUALITY.

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A NUMBER of young SOWS are available FOR SALE at ages ranging from 2 to 6 months old. These are all High-class Pedigreed Animals, and have been carefully selected from large thrifty litters. The TAMWORTH is fast becoming the MOST POPULAR TYPE of PIG for crossing with thick-set Berkshire and similar types.

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BERKSHIRES, LARGE and MIDDLE YORKSHIRES, POLAND CHINAS, and BRITISH LARGE BLACKS are also kept, and young Stock of both sexes are available.

Application should be made to—

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Hawkesbury Agricultural College,
RICHMOND, N.S.W.

BULLS FOR SALE

AT HAWKESBURY AGRICULTURAL COLLEGE.

RED POLL.—Belmont Ajax (No. $\frac{1}{62}$): calved 7th January, 1912; colour, red; sire, Acton Ajax (imp.) (9,655); dam, Shamrock, by Magician, (imp.) (5,021); from Spinster, by Laureate (imp.) (1,563) from Spot (imp.) (5,136 R.P.H.B.). Price, **30 guineas.**

AYRSHIRE—Ayrshire Lad: calved April, 1914; colour, brown and white; sire, Wyllieland Bright Lad (imp.); dam, Primrose II, by The General from Miss Prim, by Mischief-maker of Barcheskie (imp.) from Primrose of Barcheskie (imp.). Price, **12 guineas.**

	Milk lb.	Fat per cent.	Butter lb.
Milk yield of dam	6,420	3·6	271

BULLS FOR SALE—*continued.*

AT BERRY EXPERIMENT FARM.

MILKING SHORTHORNS.—The Irishman (imp.) (495): date of birth, 12th August, 1911; colour, red, very little white; sire, Tipperary Bull; dam, Colleen Bawn (imp.), (1333 M.S.H.B.). Price, **40 guineas.**

Milk yield of dam :—	Milk lb.	Fat per cent.	Butter lb.
Colleen Bawn	6,937	3·8	309

Lord Gibson (636); date of birth, 11th December, 1913; colour, red, with white star; sire, Limerick Lad (imp.) (192 vol. iii, M.S.H.B.); dam, Lady Gibson (imp.), passed vol. iv, M.S.H.B., by Tipperary Bull, from Gibson Girl (imp.), (1,465 vol. iii, M.S.H.B.). Price, **20 guineas.**

Milk yields :—	Milk lb.	Fat per cent.	Butter lb.
Lady Gibson (imp.)	6,960	3·5	285 first calf.
Gibson Girl (imp.)	9,291	3·5	380

Prince of Temora; date of birth, 1st March, 1914; colour, roan; sire, Cameo of Darbalara, (154 vol. iii, M.S.H.B.); dam, Primrose VIII. of Darbalara (passed vol. iv., M.S.H.B.), by Emblem of Darbalara (100 M.S.H.B.) from Primrose of Bolaro, (568 vol. i, M.S.H.B.). Price, **15 guineas.**

No record of dam. Calf allowed to suckle.

Imperial Favour (653); date of birth, 19th May, 1914; colour, rich roan; sire, Imperialist (183 M.S.H.B.); dam, Mooki Favour (1604 M.S.H.B.), by Royal Duke 2nd (imp.) from Mooki Rose (487 M.S.H.B.). Price, **18 guineas.**

	Milk lb.	Fat per cent.	Butter lb.
Milk yield of dam (incomplete)	5,671	4·0	266·70

HOLSTEIN.—Major Spot (641): date of birth, 10th January, 1914; colour, black and white; sire, Cavalier; dam, Lolkje Field, by Garfield (imp.) from Lolkje, by Joubert, from Lolkje Veeman (imp.). Price, **18 guineas.**

Cavalier, as above.

Joubert by Obbe (imp.) from Schot V (imp.).

Milk yields :—	Milk lb.	Fat per cent.	Butter lb.
Lolkje Field	4,943	3·2	185
Lolkje	5,828	3·5	234
Lolkje Veeman (imp.)	1,996	...	479
Schot V (imp.)	9,110	...	288

JERSEYS.—Wagga Aeronaut (315); calved 20th March, 1914; colour, whole fawn; sire, Grenadier (imp.); dam, Wagga Aitua (787 A.J.H.B.). Price, **12 guineas.**

Wagga Commander (319): calved 10th June, 1914; colour, whole fawn; sire, Aitua's Lad; dam, Wagga Clover (781 A.J.H.B.); Aitua's Lad, by Kaid of Khartoum, from Wagga Aitua (787); Kaid of Khartoum, by Sir Jack from Egyptian Belle (382); by Tidy Punch, from Egyptian Princess (imp.) (65 A.J.H.B.). Price, **12 guineas.**

AT NYNGAN FARM.

KERRY.—Sambo: calved 12th September, 1910; colour, black; sire, Bratha's Boy; dam, Darling, by Kildare II from Belvidere, by Kildare (imp.) from Belvidère Brátha 3rd (imp.), Price, **18 guineas,** delivered in Sydney.

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Under Secretary and Director of Agriculture.

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Breed.	Name of Bull.	Sire.	Dam.	Stationed at—	Engaged up till—
Shorthorn ...	Melba's Emblem (Vol. IV. M.S.H.B.)	Emblem of Darbalara (100 M.S.H.B.)	Melba 3rd of Darbalara (1058 M.S.H.B.)	Berry Farm ...	‖
" ...	Imperialist ... (183 M.S.H.B.)	Florio	Lady Nancy of Minembah.	Berry Farm ...	*
Jersey ...	Grenadin (imp.)	Attorney (9477)	Cyril's Carnation (imp.).	Yanco Farm ...	*
" ...	Trafalgar ...	Best Man ...	Rum Omelette	Cowra Farm ...	*
" ...	Kaid of Khartoum	Sir Jack ...	Egyptian Belle	H. A. College ...	*
" ...	Leda's Retford Pride.	Dinah's Lad ...	Leda's Angel..	Wagga Farm ...	‖
" ...	Goddington Noble XV (imp.)	Goddington Noble	La Franchise 3rd.	" ...	*
Guernsey ...	The King's Mirror	Calm Prince ...	Vivid (imp.)...	Woodburn ...	19 Oct., '15.
" ...	Star Prince ...	Calm Prince ...	Vivid (imp.)...	Murwillumbah ...	— Oct., '15.
" ...	Godolphin Moses (imp.)	Golden Hero of the Vauxbelets (1929)	Rosetta (6509)	Wollongbar Farm	
" ...	Hayes' Fido (imp.).	Hayes' Coronation 3rd.	Hayes' Fi-Fi 2nd.	Wollongbar ...	31 Dec., '15
" ...	Claudius (imp.)	Golden Star II..	Claudia's Pride (imp.).	Murwillumbah ...	30 June, '15.
" ...	George III ...	King of the Roses	Calm 2nd ...	Wollongbar Farm	‖
" ...	The Peacemaker	Calm Prince ...	Rose Petersen	Wollongbar Farm	‖
" ...	King of the Roses	Hayes' King ...	Rosey 8th (imp.).	South Kyogle ...	30 July, '15.
" ...	Lauderlad ...	Laura's Boy ...	Souvenir of Wollongbar	Mullumbimby ...	6 Oct., '15.
" ...	Belfast	King of the Roses	Flaxy 2nd ...	Tyalgum	28 May, '15.
" ...	Royal Preel ...	Itchen Royal ...	Hayes' Lily du Preel (imp.).	Murwillumbah ...	30 Aug., '15.
" ...	Alexander the Great.	Claudius (imp.)	Alexandrina of Richmond.	Warneton ...	27 Sept., '15.
Ayrshire ...	Wyllieland Bright Lad (imp.)	Wyllieland Gleniffer (7229)	Wyllieland Sangie	Glen Innes Farm..	*
" ...	Isabel's Majestic	Majestic of Oakbank.	Isabel of Glen-eira.	Grafton Farm ...	‖
" ..	Lessnessnock (imp.) (500 A.H.B. of A.)	Marshal Oyama (5841 A.H.B. of S.)	Bloomer B. of Lessnessnock.	" ...	‖
Holstein ...	Sultan La Polka (imp. N.Z.)	King of Dominos (297 N.Z.H. & F.H.B.)	Princess La Polka (292 N.Z.H. and F.H.B.)	Berry Farm ...	*
Kerry... ...	Castle Lough Ranger (imp.)	Waterville Rover	Castle Lough Lizzie.	Bathurst Farm ...	*

*Available for service only at the Farm where stationed. † Available for lease or for service at the Farm where stationed.
‖ Available for special service where stationed upon application to the Under Secretary

AGRICULTURAL SOCIETIES' SHOWS.

SECRETARIES are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 21st of the month previous to issue. Alteration of dates should be notified at once.

1915.

Society.	Secretary.	Date.
Peak Hill P., A., and H. Association	A. Yeo	July 28, 29
National A. and I. Assn. of Queensland (Brisbane)	J. Bain	Aug. 9–14
Narandera P. and A. Association	H. S. Robinson	,, 10, 11
Trundle P. and A. Association	W. E. Herborn	,, 10, 11
Corowa P., A., and H. Society	J. D. Fraser	,, 16, 18
Murrumbidgee P. and A. Association (Wagga)	A. F. D. White	,, 24, 25, 26
Parkes P., A., and H. Association	G. W. Seaborn	,, 25, 26
Ariah Park P., A., H., and I. Association	J. E. Rowston	,, 31, Sept. 1
Germanton P., A., and H. Society	J. S. Stewart	,, 31, ,, 1
Grenfell P., A., and H. Association	G. Cousins	,, 31, ,, 1
Narrabri P., A., and H. Society	D. J. Bridge	,, 31, Sept. 1, 2
Manildra P. and A. Association	A. Anderson	Sept. 1
Albury and Border P., A., and H. Society	W. I. Johnson	,, 7, 8, 9
Young P. and A. Association	T. A. Tester	,, 7, 8, 9
Cowra P., A., and H. Association	E. W. Warren	,, 14, 15
Cootamundra A., P., H., and I. Association	T. Williams	,, 14, 15
Canowindra P., A., and H. Association	G. Newman	,, 21, 22
Temora P., A., H., and I. Association	A. D. Ness	,, 21, 22, 23
Northern A. Association (Singleton)	J. McLachlan	,, 22, 23, 24
Murrumburrah P., A., and I. Association	J. A. Foley	,, 28, 29
Yass P. and A. Association	E. A. Hickey	,, 29, 30
Tweed River A. Society (Murwillumbah)	A. E. Budd	Nov. 10, 11

1916.

Kiama Agricultural Society	G. A. Somerville	Jan. 26, 27
Southern New England P. and A. Association (Uralla)	H. W. Vincent	Feb. 29, Mar. 1
Tenterfield P., A., and M. Society	F. W. Hoskin	Mar. 7, 8, 9
Crookwell A., P., and H. Society	M. P. Levy	,, 9, 10
Nepean District A., H., and I. Society	P. J. Smith	,, 10, 11
Central New England P. & A. Association (Glen Innes)	G. A. Priest	,, 14, 15, 16
Camden A., H., and I. Society	A. E. Baldock	,, 15, 16, 17
Armidale and New England P., A., and H. Assoc'n.	A. McArthur	,, 21, 22, 23, 24
Quirindi District P., A., and H. Association	C. G. Brandis	April 4, 5, 6
Upper Hunter P. and A. Association (Muswellbrook)	R. C. Sawkins	,, 12, 13, 14

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The Ass and the Mule.

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THE genus *Equus* is divided into *E. caballus,* which embraces the horses; *E. asinus,* the asses; and *E. hippotigris,* the zebras and quaggas. The second group includes all true asses, and are plain coloured; the third group is distinguished by prominent stripes.

In various parts of the broad plains of Asia, covering parts of the highlands of Tartary, Thibet, Afghanistan, Persia, and Syria, are to be found herds of wild asses. These animals possess many close resemblances, being yellowish or isabelline in colour, lighter or white below, with a dark brown stripe along the spine. There are three distinct species with similar habits, all swift of foot, and all with the reputation of outstripping the fleetest horse in speed.

The origin of the ass is veiled in obscurity. Long before the horse is recorded as a helpmate to man, we find the ass mentioned in Egypt as having been domesticated. This is supported by the discovery of a wild ass in Abyssinia and other portions of the northern parts of Africa. Sir Samuel Baker writes :—"Those who have seen donkeys only in their civilised state, have no conception of the beauty of the wild or original animal. It is the perfection of activity and carriage, and has a high-bred style in its deportment, and a high-actioned step when it trots freely over rocks and sands, and the speed of a horse when it gallops over the boundless desert."

Environment, in which variations of climate and soil combine to alter the species, is not altogether responsible for the ass as we commonly know it to-day. Neglect and ill treatment by man have also contributed to the deterioration from the above standard to that with which we have become familiar.

The prevailing colour is grey, but varieties appear in every shade from pure white on the one hand to dark brown and black on the other. The dark vertical stripe on the shoulder also varies in density of colour and width, but the medial dorsal stripe along the spine is invariably conspicuous.

There are great differences in size. In one part of India they are little bigger than a Newfoundland dog. The best asses are found in America, France, Spain, Italy, and Malta, but of late years the breeders in the United States, by intelligent application of the laws of breeding and careful selection, have produced asses closely rivalling the splendid breed at Poitou, in France. In St. Louis, Kansas, and Kentucky it is not an uncommon thing to see standard jacks—full of character—standing 15 to 16 hands high, and weighing from 1,000 to 1,250 lb.

The female ass produces a highly nutritious milk, prized by persons suffering from indigestion. The milk contains more sugar (lactose) and less casein than that of the cow.

The assertion is made by some breeders of horses, who evidently fear competition with mules, that "the mule gets nothing from the jack except his thick head, uncouth ears, and a disinclination to work." They do not hesitate to decry, in a reckless fashion, the breeding of mules, adducing the arguments that they do not reproduce their species, are not as active as horses, and many similar specious reasons. It is not claimed here that the mule will replace the horse or interfere with the latter's position in the numerous spheres in which the horse assists man. Furthermore, it has to be fully admitted that in the past the care has not been given to that selection and breeding of mules that has been devoted to the more popular animal. With the exception of Poitou in France, Malta, and a few spots in Spain, the system of mule-breeding practised in the past has not produced the best results, but this is being steadily rectified, and nowhere in more certain fashion than in the United States, where the mule to-day occupies a very high place in the judgment of agriculturists and miners. Over four millions of mules are in use there. The intelligent and hard-thinking mule-breeders of St. Louis, Kansas, Kentucky and other centres are carrying on operations on a scale so extensive as in themselves to be some evidence of the soundness and success of their methods. With a keenness and discretion in selection that rivals the discrimination shown in breeding horses, thousands of mares are mated every year with jacks, instead of being stinted by stallions.

Standard jacks are so well bred, with regard to size, stamina, soundness, temper, and gameness, that they can be compared with the finest produced at Poitou.

In his very interesting book, "Riders of Many Lands," the late Colonel Theodore A. Dodge, a veteran of the American Civil War, and one of the most authoritative and accomplished horsemen in the States, remarks that "Of all the horse-flesh, so to speak, the patient ass takes the lead.

"In every country where severe economies are thrust upon the people, the ass comes to the rescue, and does the work which no other animal can do. He lives on nothing—or nearly so—is rarely fed, and in time of drought or extra hard work is turned out loose to eke out with a pittance of barley whatever he may find. He is never vicious or obstinate, but works hard and faithfully till his poor old ears flop downward from age, his head droops from weariness, and he literally falls under his load to die in his tracks after having served his often cruel master some score or more years.

"When he is put to work as a yearling—for he often is—he does not last so long. I have ridden one at eighteen months old, which had been trained but two weeks, but yet was gentle, bridle-wise, and well gaited. Where is there such a horse?

"The utility of the ass is always recognised. There is no question that, feeding quite apart, the ass will kill any horse or mule; and it is clear that, weight for weight and load for load, he daily outdoes the camel. The latter, weighing 1,500 lb., carries 500 lb. The ass weighs 250 lb. to 400 lb., and while carrying 150 lb. to 300 lb. outwalks the camel by a mile an hour.

"In the Mexican mines a donkey that weighs not more than 500 lb. at the outside, will carry a load of ore equal to his own weight out of the mine, and return for the next load, keeping it up all day. He is fed high to enable him to do this, and does not live long, but what other beast can equal this feat for even a week? The ass in Algeria often carries three-fourths of his own weight all day long. I have studied this small creature carefully, and I marvel how he can perform such tasks as are often set him.

"It is well known that a man can outlast, outwork, and outcarry a horse. But the ass can endure more even than man, who otherwise is the most enduring of living creatures. He is able to carry his own weight and work all day. What man can stagger for one hour under a burden of from 150 lb. to 200 lb."

Mule-breeding.

In dealing with the subject of mule-breeding, it has to be remembered that originally the horse was represented by seven different types, all of which readily inter-bred in a state of captivity or domestication. The horse and the ass are the most distantly removed in point of structure, temperament, and in several other important features. When crossed they give us the mule, but in all past experience difficulties presented themselves to the uninitiated in the matter of securing a reasonable percentage of foals. The combination was always recognised as providing qualities useful to man, and for certain classes of work the mule excels the individual qualities of its ancestors. Mule-breeding has been followed for thousands of years, and the practice doubtless arose in those countries where civilisation originated. Their useful qualities have been studied by some and neglected by others, but as a general rule where skill and judgment have been intelligently exercised, their commercial value has resulted in a steady improvement in the methods of breeders. Increased speed and movement over broken and harsh country as well as on sunburnt sandy plains, has been gained. In their wild state, both horses and asses have always favoured open dry plains or upland hilly country with abundant sunlight.

The length and mobility of the neck, the keen sense of smell, the alert and accurate sight, the position of the eye and ear, enable them to detect unerringly the approach of danger, while the length of limb, the angles that the different segments form with each other, and the combination of stability, lightness, and durability of the feet give them speed and powers of endurance surpassing those of almost any other animal. The most reliable animals are bred in dry open or broken hilly country, and on elevated plains with constant sunlight and a low rainfall. Fresh air, a dry atmosphere, and sparse pastures are conducive to a strong muscular development and hardy constitution, in contrast to the enfeebled animals reared in gloomy forests or on flat marshy country. In this respect Australia possesses definite and peculiar advantages for breeding mules.

It has already been mentioned that mule-breeding has its difficulties from a mating point of view, and different methods of ensuring successful impregnation are followed in various countries.

An Expert's Opinion.

With the object of getting into touch with a reliable expert, I determined, when in America, to visit the mule-breeding establishment of Messrs. Miller and Luxe (Limited), in the San Joaquin Valley, California, where the firm owns several ranches on which a large number of mules are employed. Accompanied by one of the firm's superintendents, Mr. Eric Reay Mackay, B.S.A., a former student of Hawkesbury Agricultural College, we motored out from Los Banos to the Ascot Mule-breeding Farm, and met the expert in charge, Mr. Dalzell, a sturdy sample of the courteous and intelligent American.

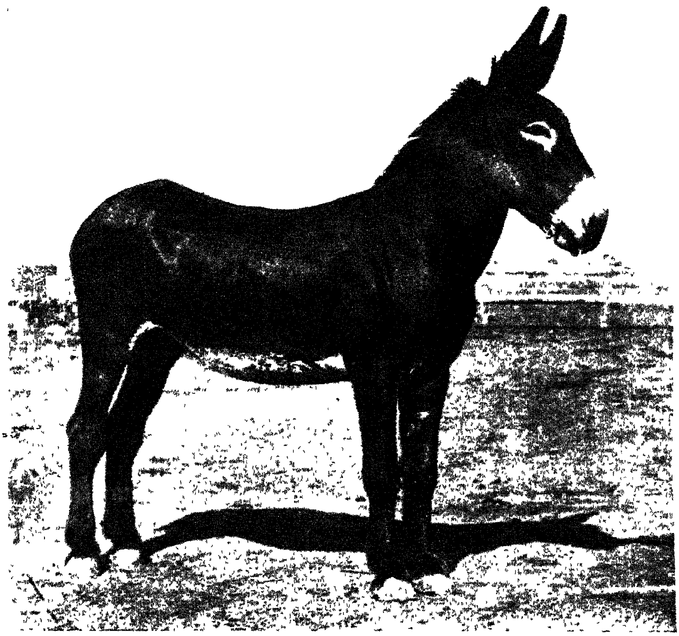
I soon verified the assurances of my companion that in this gentleman we would discover an expert unequalled in experience and special knowledge of mule-breeding in the United States. He is engaged by the firm solely for the purpose of breeding high grade mules for their various ranches, on which are conducted stock breeding, rearing, and feeding, irrigating for lucerne, and growing barley.

He has sole charge of the stud and its appurtenances, selecting the mares and jacks, and breeding the latter, and he supervises all operations in connection with breeding, feeding, handling, and managing. He proved highly interesting and communicative, and discussed his subject with a confidence and assurance only obtainable by long specialisation. Mr. Dalzell has the advantages of a well-equipped steading, a series of corrals or yards, fields and buildings, all erected and arranged to facilitate the various operations.

From eight to ten standard jacks are used as sires during the season, which runs from 1st March to 1st July, or three months of late spring and early summer. Each jack is well-proportioned and distinctly marked, has a short powerful back, broad shoulders, full girth, powerful legs, well-formed feet, and shows ample quality and gameness. They stand from 14·2 to 15·2 hands high; occasionally one is used up to 16 hands. The weights favoured run from 1,100 lb. to 1,250 lb.; in a few instances this maximum has been exceeded, but none are used under the minimum weight of 1,100 lb. A jack is considered mature and fit for stud purposes at 3 years old, and is allowed sixty mares per season.

The mares selected are all clean-legged, big-bellied, roomy animals. Mr. Dalzell is somewhat partial to Percherons, or cross-bred mares with Percheron blood predominating, but he uses all breeds. The only condition he strictly imposes is that they must be sound and free from all hereditary defects. He also discards any mare showing evidence of bad temper or vice. The mares must not be undersized, and he refuses all below 14·2 hands, preference being given for those standing 15 hands high.

Mr. Dalzell emphatically adheres to the belief that the mare has a distinct influence in largely determining the useful qualities of the progeny. He assigns to her the power to transmit height, size, disposition, intelligence, gameness, activity, and staunchness. Any tendency in the dam to hock or leg troubles, colic or flightiness, he expects to appear in some degree in the foal. Mule-breeders frequently assign aged males to the stud, but Mr.



Jack. John Marshall, Jr. (No. 4328).

Sire: John Marshall (No. 1738). Grandsire: Hindoo. Dam: Miss Robinson (by Prince Albert).

Jack. Libord (No. 4084).

Sire: King Giant (No. 683). Grandsire: Independence 196 I (by Washington Pond). Dam: Miss Libord.

IMPORTED JACK DONKEYS

Big Belle. Jane H.

Jennet. Big Belle (No. 1568).

Sire: Emerson's Pride (S.B. No. 735). Dam: Mollie Bankhead.

Jennet. Jane H. (No. 3211).

Sire: Young Giant. Grandsire: Giant (No. 32). Dam: By Tarkington's Napoleon.

A third Jennet (not illustrated) has the following pedigree:—

Lucy K. (No. 2078).

Sire: Jim Bright (No. 738). Grandsire: Klondike. Dam: Nettie J.

IMPORTED JENNETS, LOCATED AT YANCO EXPERIMENT FARM.

Dalzell condemns this practice in no measured terms. He advises all to use only mares that are young, or up to middle age for this purpose. Bays in colour are recommended, despite the fact that the jack naturally prefers a grey mare.

In allotting to each jack the number of mares for service in a season, he adopts the practice of giving the sire three mares in two days. Following service, the mare is passed into a paddock for observation for twenty-one days. The paddock must be in a quiet locality, where there is no chance of the animal being aroused to sexual excitement, or mischief being done by geldings, or any stock likely to disturb her. At the end of this period, or on any day between the fourteenth and twenty-first from the date of service, she is sent again to the jack, and if symptoms of horsing or œstrum fail to appear, she is turned out and considered effectively stinted.

Our next question was relative to the percentage of foals. Mr. Dalzell has kept reliable records extending over a number of years, and states that his average is 65 per cent.

Mares are fed largely on lucerne in addition to grazing, and they are worked steadily close up to the foaling period. In every instance the date of service is faithfully recorded, and the period of gestation calculated. The jacks are mainly fed on lucerne.

Breeding Jacks.

One special line of inquiry pressed on our host was how the natural aversion of the jack to the mare was overcome, and how the difficulty of unsuccessful impregnation, which presents itself to breeders of mules, is surmounted.

In the past this has largely disheartened breeders in Australia, and has kept the mule-breeding industry much in the background. Instances were given of indifferent success in this direction, and the methods pursued at the critical period were freely discussed.

Mr. Dalzell's success as a mule-breeder appeared at once in the percentage of foals, viz., 65 per cent., and his statement on this point was carefully noted. He bases the return on the fact that the jack's environment from the day he is weaned determines his sexual efficacy. The chief concern of the mule-breeder, Mr. Dalzell clearly indicated, should be to keep any jack intended for the service of mares absolutely and entirely separated from contact with the opposite sex of his own species. Jennies should never be seen or heard near a mule-breeding farm. The jack that is intended for siring mules should be foaled on a distant ranch or farm, and as soon as he is weaned at six months old he should be taken from the mother, and placed sufficiently far away for there to be no possibility of his hearing or seeing her or any other of her species. In point of fact, it is safer to avoid his seeing any other ass.

He is turned into a paddock with a filly that has also just been weaned, and jack and filly live and feed together without interference or disturbance from any other form of stock. They become close mates, and gradually

develope a mutual attachment. Eventually the filly exhibits symptoms of horsing, and in due course she is served by her mate. After that no trouble is experienced in persuading the jack to serve mares. His natural aversion has been overcome, and a high percentage of foals is assured. It is well to bear in mind that, all through his career as a sire for mule-breeding, the jack must not be associated with donkeys of either sex, more especially with she-asses. Should this happen, accidentally or otherwise, the jack becomes unreliable as a foal-getter, and the percentage is lessened in a marked degree. He loses the affection for mares, and revives the natural instinct for the jenny. When mules are weaned at the Los Banos ranch they are grazed on lucerne, and are easily handled and broken-in at 3 years old.

The Value of the Mule.

In the course of a long discussion on the merits of the mule as a helpmate to the man on the land, numerous aspects in which the mule has proved superior to the horse were brought out. The chief value of the mule mentioned by Mr. Dalzell is when he is utilised for one type or class of work. The animal becomes quite a specialist therein, and hence is more efficient. Take the case of cultivation in the beet and maize-growing districts. The mule travels at a regular pace, and passes through row after row without treading on a plant. Where irrigation is practised the mule can always be relied upon to get through soft and slushy ground. In the various implements, such as the header or harvester, in the wheat or barley fields, mules are easily handled in combination. It is quite an impressive sight to see a man perched above the header, controlling thirty-two, thirty-five, or thirty-seven mules in a team. In dray work, three mules in tandem fashion, move along with the guiding voice of the driver with wonderful intelligence. In numberless ways on a ranch, farm, orchard, or irrigation area they rapidly become accustomed to the technique of the job.

Mules do not show signs of distress in hot weather so quickly as horses, and they work consistently in season and out, day by day, all the year round, usually until 20 years old; individual cases are known where they have kept up constant toil till 30 or even 35 years old.

They are more even-tempered than horses, respond to the voice of the driver more precisely, and are more readily handled and controlled. They are, indeed, workers when one class of work is constant.

The hoofs are tough and durable, and do not wear in ordinary farm or orchard operations, and shoeing is only necessary where work takes them on to metalled roads. They rarely become affected by disease, though in the States they are subject to an infectious form of glanders. Occasionally they show symptoms of colic (generally traceable to the influence of the mare), but only on very rare occasions has Mr. Dalzell found them suffer from curb, splint, or ringbone, and has never seen a case of spavin in a mule. They do not care for housing, and sleep as well as feed in the open.

A mule always kicks as a safeguard or in self-protection; a horse often as a result of temper and vice. When a mule is forced into a position which

it resents through fear, apprehension, or anger, and finds it necessary to defend itself, it kicks straight out vigorously, but it does no damage of any consequence. A horse dashes off, kicks itself free of everything, and madly rushes into obstacles with disastrous results. Not so the mule. It is more philosophical, and has too decided an objection to taking personal risks to be vicious.

Take a typical case of alarm. A man has been known stupidly to pass in front of an unattended team of mules, wearing a loose motor coat that waved about him in the wind. This sudden apparition created instant alarm; the mules bolted, but they did not kick the harness off or dash into a hedge or ditch, but as soon as they reached an obstacle they pulled up. A mule may dash off, but he will not effect any damage such as a horse will under similar conditions. He has sense enough to know that a collision must inflict personal injury, and, therefore, pulls up. The horse pursues his mad career, injuring himself, and smashing everything to which he is strapped.

All the grooms and workmen associated with mules speak of them in affectionate terms, and are inclined to be more than enthusiastic in their praises of the many qualities of the animals. One could not but admire the great attention these men paid to their charges in keeping them in good condition. With well groomed and shining coats and close-clipped tails, everything contributed to the impression that a warm regard was felt for the comfort, welfare, and appearance of the animals.

The Mule as a Factor in Exploration.

In the strenuous days associated with exploring and crossing the Rockies, both by road and trail, wheeled vehicles were unsuitable, and other means of carrying food supplies, camp equipment, instruments, and other paraphernalia had to be arranged. The explorers were compelled to maintain a large body of pack animals, and the majority of these were mules. For hardiness, safety, courage, and endurance the mule acquired the highest reputation, and his market value for this class of work was three times that of an ordinary hack. The starting of a working expedition was marked by considerable fun, particularly when the assembling and loading of stores was taken in hand. The Californian pack-saddle, or aparajos, was used, and very strong, large canvas bags or cylinders, not unlike stove-pipes, were made. Into these were packed stores, bedding, and other materials. Probably the mule had just been broken in, or had been out of work for a long period, and the hazardous ordeal of loading the animal was one to be remembered.

The western mules are small, sinewy, tough, and hardy, but clever and sly. Most of them are bred from Indian ponies, and are born and reared on high open plateaux. They are lassooed and branded at 3 years old, and driven or coaxed into a corral (a small paddock), and sold as bronchos. An untamed horse is a model of gentleness in comparison. These mules are broken into harness or saddle, and often straight into use as pack mules.

The procedure of breaking-in is described by a prominent journalist:—"An unbroken mule having been dexterously roped or lassoed is led into an open space; he steps timidly but quietly, not noting cause for alarm. A noose of the rawhide lariat is slipped over his nose, and an advantage is gained. He pulls, shakes his head, stands upright alternately on his fore and hind feet, but the harder he pulls the tighter the noose pinches his nostrils. Eventually he succumbs. Then a man adroitly approaches him and slips a leather blinder over the mule's eyes. If the ears are touched in the operation, then the animal uses his heels, and the man has to keep clear. Everyone avoids the business end of a mule at this stage. Another effort has to be made, and the animal once more lassoed, thrown, secured, and roped. In a short time he becomes thoroughly subdued, and the process of saddling and packing begins. The first thing it troubles over is the crupper. This invariably arouses a show of resistance and inordinate kicking. Strategy wins. The mule tires. The pack saddle follows, then the girth. More bucking, arched back, head between his knees; a spring, and he lands on stiff legs, with a view to jerking off his burden, or falling on his side and rolling over to scrape off the pack. He will sit on his haunches and hurl himself backwards, duck his head, and turn a somersault. Finally, he stands, still trembling with excitement, indignation, and anger, combined with exhaustion. Lead him away, conquered."

The mule is the mountaineer's mainstay, and easily beats the horse for endurance, courage, and carrying power in broken and mountainous country, and especially reliable in fording rivers.

The Mule in War.

Another phase of the incomparable utility of the mule lies in the direction of campaigning during war. Whilst all realise its value in the past, particularly in India, it is due to this animal to acknowledge the debt we owe it even in connection with the present conflicts. The evidence of an Indian officer at the front may be quoted from *The Times*, London, of 12th January, under the *nom de plume* "An Anglo-Indian." He states:—

"The best-fed army in history owes the super-excellence of its canteen to the motor-lorries which feed the trenches on nearly the whole line of front from the sea to Nancy. But there are combinations of the elements which defeat the last word of scientific transport, and that is where the Indian mule cart comes in.

"I was surprised to see three of them swinging down the road the other day, the mules leaning against each other as packed mules will do when trained to the yoke. The little convoy pulled up outside the courtyard of an abattoir in an old town in France, where it had been raining in torrents for days, until earth and water had produced a third element, which resembled neither.

"'How do they stand the damp?' I asked the driver, a Punjab Mussulman, 'Much sickness?' 'No, Sahib. Only one has been sick. None have died except those destroyed by the bombs.'

"I wondered what the carts were doing in this place. They were the first line, and the first transport carries the food into the very mouth of the army. Being the last link in the line of communications, it is really the most vulnerable. Other links are out of the range of the enemy's guns, and immune, in this phase of the operations at least, from attack, except by air craft. The driver explained that they had been detailed for forage work.

"Just then an officer of the Indian Army Supply and Transport Corps rode up, and I got him to talk, as I knew I could if I praised the mules and carts enough. He enlarged upon the virtues of the most adaptable, adjustable, and indestructible vehicles that had ever been used in a campaign, and on the most hardy, ascetic, and providentially accommodating beast that had ever drawn or carried the munitions of war.

"Theses light transport carts are wonderful. They cut through the mud like a harrow over thin soil. The centre of the road is left to the lorries. 'They would be bogged where we go,' the officer said proudly. 'They are built for swamps and boulder-strewn mountain streams. If the whole show turns over you can right it at once. If you get struck in a shell hole you can cut the mules loose, use them as pack transport, and man-handle the carts. Then we have component parts. We can stick a wheel on in a minute, and we don't get left like that menagerie of drays, furnishing vans, brewers' carts, and farmers' tumbrils, with no extra parts at all; inadaptable things—some of them like a lot of rotten curios. And, of course, you know you can take them to pieces and pack fourteen of them in a truck.'

Then he enlarged on his beasts. Nothing ever hurts a mule short of a bullet or shell. Physical impact—heat or cold, or drought, or damp—it is all the same. They are a little fastidious about drink, but they deserve one indulgence, and a wise staff officer will give them a place upstream for watering above the cavalry. For hardiness nothing can touch them. They are as fit in Tibet as in the Soudan, as composed in a blizzard on the Nathu-la as in a sandstorm at Wadi Halfa; and I know that every word he said was true. I had sat a transport cart through the torrents of Jammu, and had lost a mule over a precipice in a mountain pass beyond the Himalayas. It lay half-buried in the snow all night with the thermometer below zero. In the morning it was dragged up by ropes and began complacently grazing.

"'And look at the men now in this slush!' They certainly showed no signs of distress, or even of depression. 'Not a bit! they are splendid. They have no nerves; no more nerves than the mules.'

"It occurred to me that the Asiatic driver assimilated the peculiar virtues of the beast. The man with a camel or bullock or mule is less excitable; more of a fatalist than the man who goes on foot alone. The mule and the driver would rattle along under shell fire as imperturbably as they would run the gauntlet of falling rocks on the Kashmir-road in the monsoon."

Passing through the Suez Canal we had the privilege of inspecting the the splendid provision made to protect the great waterway from invading forces. In each camp the mule was the prominent beast of burden, both

for war munitions and for food supply. A few camels here and there were associated with their hardy mates. Here mules have their allotted tasks, and, in keeping with their inherited characteristics as specialists, they are found the most reliable under the extreme conditions of war. In France they have resisted snow, cold, floods, and bad roads. In Egypt they meet the prevailing sunlight, sand, and drought with equal fortitude, hardiness, and patient endurance.

The Prospects of Mule-breeding in Australia.

Taking mule-breeding as a suitable industry for many specialised aspects of agriculture, and particularly those connected with irrigation, it appeals to one's common-sense when witnessing their great utility in other countries that there is splendid scope for this animal in Australia.

We possess all the natural features so essential for their growth and development. Doubtless many failures have occurred in the sporadic efforts made from time to time to induce farmers to employ the animals, but our agricultural methods are becoming more intensive and practical, and we are facing a new era in emulating the example of progressive States such as California, Colorado, Nevada, Utah, Iowa, and Wisconsin. In the phenomenal development of those States, the mule has been an enduring helpmate to the irrigationist, the farmer, and the orchardist.

It is something worthy of remembrance to have personally witnessed the splendid work those animals perform, and to have heard the recognition of their services by their owners.

In Canada, mule-breeding is not carried on to any extent, the climatic conditions being widely different. Our conditions, however, closely resemble those of California where the mule has been successfully bred and used.

A warning note, however, may be sounded in relation to the interchange of breeding mules and horses from the same mare. After once giving birth to a mule, mares should not be used for breeding horses, for the offspring will, undoubtedly, show more of the characteristics of the mule than of the horse.

Recently a large number of horses were purchased in the southern States of America for the British Army authorities, and a number resembled mules so strongly that it was found necessary to look them over carefully before deciding that they had not been sired by jacks. Their heads, necks, and bodies closely resembled the mule, while their ears were almost as long. In the legs and feet, however, they resembled the horse. These animals had been bred from mares that had previously been used for mule-breeding.

The financial aspect, as between the breeding of mules and that of horses, is for local consideration. The mule is very hardy, long-lived, stands constant work, is free from disease, and, in special classes of work, outrivals many classes of horses.

Wheat-breeding in New South Wales.

J. T. PRIDHAM, Plant Breeder.

To the average man there is a sameness and uniformity about the appearance of a wheat-field, the only thing to break the monotony of a well-grown crop being stray black oats and other weeds. Where the soil is inferior and the plants, as the result of bad germination, show a thin stand, one may isolate individuals which show differences. Had it been customary to sow wheat grains singly like peas in a row, we should long ago have had numerous wheat novelties advertised in the seedsmen's catalogues.

The importance of the wheat crop and the discovery of individual differences have led many investigators and growers of late years to attempt improvement in yield by various methods of breeding. The grower has been educated in respect of the value of proper cultivation of the crop, from the time of horse-hoeing husbandry of Jethro Tull down to the moisture-conserving fallows of modern dry farming. Information has been supplied in regard to the fertilisers required by wheat, so that nothing may be lacking in the way of plant-food for the production of a large crop. The average farmer pays considerable attention to the breeding of his live-stock, and will have nothing to do with a mongrel or a weakling, but gives scant consideration to the character of seed he sows, provided that it is not smutty or unduly shrivelled. We may secure good results by suitable preparation of the soil and manuring, but it is impossible to secure the best results from inferior seed.

In comparing the breeding of animals with that of wheat, the chief difference lies in the fact that two separate individuals are mated to yield progeny in the case of animals, whereas with wheat self-fertilisation takes place. Relatively very few progeny result from animal-breeding in a given time, while with wheat a stock of seed can be very rapidly multiplied. Each animal brings the impression of a pedigree peculiar to itself to bear upon its mate, so that the resulting offspring possess all the characteristics of both parents, either expressed or in a latent condition. It is easier and quicker to propagate plants than animals, and wheat lends itself more readily to improvement than do close or cross-fertilised plants where two individuals are concerned in seed production. Wheat, however, although nominally self-fertilised, is not quite the uniform product that one would expect. Every grain of Purple Straw wheat does not grow a plant exactly similar to its neighbour in the same way as all Jonathan apple trees bear similar fruit. We propose to discuss this later.

Origin and Classification of Wheat.

De Candolle says that "Very ancient Egyptian monuments, older than the invasion of the shepherds, also the Scriptures, show the cultivation of this crop already established." Until recently wheat had not been found growing in a wild state, but Aaronsohn, the Director of the Jewish Agricultural

Experiment Station at Haifa, in Palestine, has discovered wild wheat, which he calls *Triticum dicoccum dicoccoides*, flourishing under extreme climatic conditions in that country: from the level of the Dead Sea to the alpine zone of Mount Hermon. This confirms the testimony of ancient historians that cultivated wheat had its origin in the regions of Syria and Mesopotamia.

Wheat may be classified into the following species :—

1. *Triticum vulgare*—Common wheat, including *T. compactum* or square head.
2. *Triticum turgidum*—Poulards; valuable for their drought resistance, stiff straw, and in some varieties for their suitability for macaroni-making.
3. *Triticum durum*—Macaroni wheats, and ideal for the manufacture of this food; valued also for their drought and rust resistance.
4. *Triticum polonicum*—Polish wheat, similar in its qualities to those of class 3.
5. *Triticum spelta*—Spelt; noted for holding their grain tightly, productiveness, and hardiness. Undesirable qualities are: susceptibility to rust, brittleness of heads, and starchiness of flour.
6. *Triticum dicoccum*—Emmer; desirable qualities are: holding its grain, drought and rust resistance; weak points: brittle heads and too late in maturing.
7. *Triticum monococcum*—Einkorn; holds its grain well, very hardy, but is extremely late, and has a brittle head.

The fact that these different species of wheat can be intercrossed and will produce fertile seed seems to point to the common origin of wheat. We have successfully crossed the wild wheat of Aaronsohn with our common varieties, and the progeny is quite fertile. All our commonly cultivated wheats belong to the first class, except the macaroni varieties, such as Huguenot, Indian-runner, which are included in Class 3. Before leaving the subject of classification, it may be said that the terms "winter" and "spring" wheats are only applicable in countries where certain varieties are grown in the winter and others in the spring. A winter wheat can be changed into a spring sort by gradually altering the time of sowing, and *vice versâ.*

Importance and Status of the Crop.

Wheat is one of the few commodities the price of which sways the world's markets. Its chemical composition constitutes it an almost perfect food in itself, and one of the evidences of civilisation in any country is the proportion of wheat flour consumed. It is beyond the scope of this paper to touch upon the cultivation of the crop, but seeing that there were some 122,000,000 acres of the Australian Continent alienated from the Crown in 1910, of which 5,000,000 acres only were under wheat, there is ample room for expansion in wheat-growing. Each State of the Commonwealth has its approved varieties, and these again differ in their suitability for the various districts of that State. In the comparatively small country of Sweden it is found necessary to have a number of testing stations in order to determine the most productive varieties, and in America Hays asserted that "Extensive trials of old

and new varieties show that wheats must be specially bred for each of several conditions in Minnesota, as well as for each of the adjoining States."

In Sweden, in the United States of America, and in Canada alone large staffs of trained men are employed in wheat improvement work; and in Germany, before the present war, there were over eighty wheat-breeders, over sixty breeders of barley, and fifty of oats in public and private institutions.*

Federation wheat, for example, is not adapted to all the districts where wheat is grown in New South Wales. The Department has established breeding-plots at the Hawkesbury Agricultural College and the following Experiment Farms:—Cowra, Wagga, Bathurst, Glen Innes, and Nyngan, which represent, respectively, the Coastal, Central-Western Slopes, South-Western Slopes and Riverina, Central Tableland, Northern Tableland, and, lastly, Western Plains.

There is no crop better adapted to our climatic conditions and thinly scattered rural population. Pastoralists in earlier years opened up the country, and many districts, once considered suitable only for the grazing of sheep, are now part of the wheat-belt. There will always be country which is too rocky and too dry to produce payable crops, but the line for "safe" wheat-growing has been gradually moved westward, and within this line there are millions of acres still waiting for the plough. With the increase of population, holdings are becoming relatively smaller, though the further west one travels the natural tendency is to aim at a small return from a large area rather than a large return from a smaller area more intensely farmed.

With rational treatment wheat-growing is a safe and paying occupation requiring capital, but no particular skill or intelligence. The consistently successful farmer, however, requires to be alert and up-to-date in his methods, and, like a keen business man, quick to see where a leakage occurs in the profits. Facility of transport, good keeping qualities, and the prospect of satisfactory prices give the wheat crop a strong position, which is appreciated by the man on the land if one may judge by the crowded ballots attending the throwing open of fresh areas for cultivation.

Extension of the Wheat Belt.

Though there is much land yet unploughed in the areas receiving an ample rainfall for wheat production, the rush for land and the use of machinery adapted for very large farms point to the likelihood of more arid country being opened up. But this need not cause alarm if approved dry-farming methods are followed and the right kind of seed is employed. In this connection we may quote Mr. Robert Gauss, of Denver, Colorado, who has had considerable dry-farming experience. He says:—

"That acclimatisation of cereals to arid regions can be done by taking advantage of favourable mutations (or sports).

"That sports be searched for systematically.

"That the work calls for distinctly botanical investigations; neither late nor early plants should be neglected.

* Journal of Agric., Victoria, June, 1912.

"That the ideal plant may be most unpromising in appearance—the 'singed-cat' of the entire field—short, with dense growth, a thick stem, thick, coarse leaves, and large roots.

"That immense numbers of plants be grown for comparison.

"That a bulletin be published describing such plants, and inviting farmers in arid districts to be on the lookout for them."*

At our Nyngan breeding station we have raised crossbred varieties which escape the effects of drought by reason of their short growing season—*e.g.*, the Sunset variety. Quickly-maturing wheats, however, in districts of normal rainfall, can never yield so well as those occupying the soil for a longer period. The latter are forced to build up a greater root system, and stouter and more elaborate protective tissues, in order to withstand the heat and dryness of the climate. The problem before us in such districts is to find a plant which is able, after so much energy expended in climatic self-defence, to mature a larger crop of grain than an early ripening variety. Hitherto the latter type has yielded the best results with us, except in seasons of particularly good rainfall.

Wheat for Export and Home Consumption.

Australian wheat is always quoted at a high figure in the world's markets on account of the good flavour and dryness of the berry, but especially for the exceptional colour of the flour. British and Continental millers value it for blending with their home-grown and foreign samples. Millers in the old world have to go to the expense of bleaching their flour, but in Australia the process is unknown, as the flour from our wheats makes an attractive loaf without any such treatment.

Australian flour, however, is not in such high favour in the home markets because of its comparatively low strength for baking, so that it pays us best to export the raw material, which finds a ready sale. Mr. A. E. Humphries, an English milling authority, writing on the question of export to the Indian Government in 1909, says:—"I entertain the view very strongly that the grower in any country or district should produce those varieties of wheat which yield him the best possible financial return. In that way the public interest also is best served. Within the last twenty years the technical equipment of the best mills has been very greatly improved. Millers can now make better use of a wheat's potentialities, and overcome the objections which their predecessors had to certain varieties. British millers are content to leave to the growers and their competent advisers the decision as to what varieties shall be produced."

For home consumption the case is a little different. We are in need of a wheat which can be milled and used as a straight-grade flour without blending. Or else a proportion of wheat of high flour strength should be grown to blend with the weak flour sorts in general cultivation. It is true that many inland millers supply their customers with soft-wheat flour, from which country bakers turn out a loaf of a satisfactory character. But the city bakers, in many cases using machinery in the bakehouse, find it necessary to work with

* American Breeders' Association, vol. vi, 1909.

a blend of hard and soft wheat flours in order to produce a loaf which pleases the public. After the 1902 drought, imported Manitoba flour was employed by Sydney bakers, who have never since forgotten the superiority of this class of flour when mixed with the softer local product. New South Wales can produce wheat equal to the very best Manitoba; Cedar or Comeback flour, blended with, say, Purple Straw or Marshall's No. 3, will give quite as good results as a high-grade Canadian patent. The breeders' art has not yet compassed the union of high yield with similarly high nutritive qualities in this State; and as long as the grain buyer does not give the grower an adequate price for grain of superior quality, we cannot expect such wheat to come on the market to any extent. It can only be a question of time and the extended use of machine-made bread when the local hard-wheat varieties will command an enhanced price in New South Wales, in the same way as Manitoba and Hungarian are quoted higher than ordinary English and Continental wheats at Mark-lane.

Variation.

The fact that plants vary affords at once a basis to work upon in attempting their improvement. Seedsmen are well aware of this, and regularly examine their beds of seedlings for "rogues" or individuals which do not conform to the type required.

A variety is thus defined by Koernicke:—"Those forms of a species which can be differentiated in properly developed single individuals by definite, inherited, and easily distinguishable characters, such as presence or absence of awns."

The term species is not easy to define: it stands for a collection of kinds or varieties of plants resembling one another in certain features.

A genus is a wider term, *e.g.*, the wheat genus includes several species of wheat, and is a group of allied species. A family is a group of allied genera, as the family of grasses.

It has been discovered that varieties contain a larger or smaller number of distinct types which, on being grown separately, breed true. These are called "Biotypes" by Johannsen, and "Elementary species" by De Vries. Reverting to animal-breeding for a moment, we may raise a Leghorn hen which displays remarkable egg-laying tendencies; and if her chicks also develop this quality in an equal degree, we may say with Johannsen that we have a "pure line," or in other words a good laying "strain."

Varieties may be at least of two different kinds. Lock thus describes them:—"In the first place, we have those slight differences which invariably distinguish all the members of every family—individual variations which affect every part and every character. Such are known as fluctuating, normal, or continuous variations, *e.g.*, differences in height.

"A second kind of variation is known as abnormal, definite, and discontinuous variation, and includes what are known as sports and mutations, . . . *e g.*, a six-fingered child born into a family of normal development."

(To be continued.)

A Sample of Bush Hay.

The Inspector of Stock for the Hay district recently submitted a sample of bush hay, which was cut and stacked by Mr. C. F. Campbell, of Mulberrygong Estate, near Carrathool. The stack was well built, with a high pitch, but was not thatched or covered in any way. After being damped with molasses and water the hay was successfully fed to stock by the owner during the present drought. The two points on which information was sought were (1) the different grasses and other plants which made up the hay, and (2) an expression of opinion as to the fodder value of the hay.

The sample was submitted to Mr. E. Breakwell, B.A., B.Sc., Agrostologist, who reported as follows:—

"The varieties of plants represented in this sample of bush hay are—

Grasses.

Avena fatua, L.—Wild Oats.
Hordeum murinum, L.—Barley Grass.
Festuca myurus, L.—Rat's Tail Fescue.
Phalaris minor, Retz.—A Canary Grass.

Trefoils.

Medicago denticulata.—Wild Burr Trefoil.
Medicago truncatula, Gaertn.—Another Burr Trefoil.

Other Plants.

Helipterum corymbiflorum, Schl.—A Wild Daisy.
Plantago varia, R.Br.—Lamb's Tongue or Rib Grass.
Daucus brachiatus, Sieb.—Wild Carrot.

It will be noticed that no native grasses are represented in the sample, and the only native plants present are the three last named. This is probably accounted for by the fact that the good winter rains and climatic conditions generally of the Riverina are particularly adapted to introduced grasses and herbage, and trefoil, barley grass, and other plants have succeeded in crowding out the native grasses during the cooler months of the year.

As regards the fodder values of the plants present, all may be said to be valuable for stock. Perhaps the least valuable is *Helipterum corymbiflorum*, and the proportion of this plant (about 20 per cent.) might have been less. The barley grass was rather advanced for hay, but the other grasses were cut in a green state, when their nutritive values were of the highest.

The importance of the trefoils cannot be over-estimated, as independent of the value of the stem and leaf, the burrs, which are particularly abundant, have more than once proved a stand-by for sheep during times of drought, owing to their high nutritive value."

Practical Irrigation-farming in Australia.

With Special Reference to Fruit and Fodder Crops.

A. M. MAKINSON, B.A., Inspector of Agriculture.

PREFATORY NOTE.—In the preparation of these articles I have to acknowledge the kindly advice and assistance of the late Mr. L. A. B. Wade, M. Inst. C.E., Mr. Charles W. Smith, M. Inst. C.E., and Mr. Vaughan Rae, Secretary to the A.D.F.A., and have particularly to thank Mr. W. J. Allen for reading the proofs, and for many valuable suggestions. Wherever I am indebted to published works on Irrigation or periodicals acknowledgement has been made in the footnotes.

INTRODUCTION.

The Antiquity of Irrigation.

IRRIGATION, according to an eminent authority,* is "the oldest applied science in the world," and was first practised in the Garden of Eden, situated between Anah and Hitt, in the River Euphrates, from which the Tree of Life (the Date Palm), and the Tree of Knowledge (the Vine) were watered from free-flowing channels. We are told in the same place that strife was brought into the world through the first dispute about a water-right; that Cain (an agriculturalist) suspected Abel (a pastoralist) of cutting the reclamation banks of the Euphrates, with the object of flooding the country to get feed for his stock, at the same time swamping Cain's crops; that Joseph was a far-seeing statesman, who feared that the hostile King of Thebes in Upper Egypt would one day capture the dam controlling Pharoah's great storage basin, Lake Moeris (1,000 *square miles in extent*) on the Nile; that the dam was captured in due course, irrigation water was cut off from Lower Egypt, and the land suffered drought and famine as Joseph had foretold; that Moses was an engineer, who dammed the waters of a wide branch of the Nile delta (*not* what we call the Red Sea), made a causeway for the Israelites to cross between two walls of water—the Nile on one side and the sea upon the other—and then breaking down the dams, drowned Pharoah following with his hosts.

Though opinions may differ as to the justice of this great engineer's biblical interpretation, from the evidence of ancient landmarks found by him and by other engineers and archæologists, there can be no doubt that irrigation was the chief source of the wealth and subsistence of the ancient world—on the Tigris and Euphrates in times so remote that we know little of them; on the Nile, where the irrigated area of the ancients is estimated

* Sir William Willcocks, K.C.M.G. (designer of the Assouan Dam), in *Blackwood'* Magazine, October, 1914.

at 30,000,000 acres (five times what it is to-day); in India before its conquest by Alexander, and in the America of the Incas. Immense areas too, have been irrigated from time immemorial in China and Japan.

Irrigated Egypt supplied the Roman world with grain, but, in the early middle ages, irrigation, like the other civilised arts, there as elsewhere, fell into comparative disuse. Since that time a more or less consistently progressive irrigation policy has been maintained in Northern Italy for a thousand years, and to-day over 3,000,000 acres are irrigated in the valley of the Po. Spain waters about the same amount of land, and during the century just passed British enterprise has revived irrigation in Egypt to the extent of 6,000,000 acres, and increased the watered fields of India to over 20,000,000 acres. In America the irrigated area exceeds 4,000,000 acres in the United States alone, and large tracts are watered in the Argentine. In the far East Japan has a system of canals all her own, supplying 8,000,000 acres, and irrigation is also extensively practised in Madagascar, Java, and Siam.

The Future of Irrigation in Australia.

To those who regard irrigation as a new and doubtful experiment, and question the value of a progressive irrigation policy to Australia, these facts and figures* should be a sufficient answer. We have not the cheap labour of Eastern countries, and, as in the case of other industries, we cannot compete with some of their irrigated products in the world's markets on that account; these, however, are not of great importance, and for *meat, wool, butter, and many kinds of fruits*, a profitable world market is open to us. We have, too, a profitable home market for certain products which do not sell profitably abroad, and the dream of Australian irrigators—to see this home market extended to include a great part, if not the whole, of the British Empire—will no doubt be realised when Australian irrigators are numerous enough and commercially strong enough to push their claims. High wages make improved methods and labour-saving devices necessary all the world over, and these have enabled Australia in a small way, as they have enabled California on a large scale, to show that profitable irrigation is by no means confined to cheap labour countries; while the agreement between the States, which has at last been arrived at, as to the storage and distribution of the Murray Waters, bears witness to the recognition of irrigation by all political parties as the chief factor by means of which our vast inland areas of low rainfall will one day be enabled to support a population proportionate to the fertility of the soil. We have millions of acres of fertile land which, without irrigation, are practically valueless, and there are still millions of tons of water running to waste every year from our rivers to the sea. That the land can be profitably utilized with irrigation has been amply proved on the banks of the Murray; while the practicability of harnessing our rivers has been demonstrated by the builders of the Burrinjuck Dam in New South Wales, and of the Waranga Basin in Victoria, while in South Australia the great work of locking the Murray

* Taken mainly from "Irrigation and Drainage," by F. H. King (Ed. 1913).

River has been actually begun; so that even at this date it seems safe to say that it will be in no small degree due to a continuation of the policy which has built these works, and has established irrigation settlements at Mildura, Renmark, Merbein, the Murrumbidgee areas and the Goulburn Valley, when Australia, with ten times her present production and population, is able to take equal rank in wealth and power with any of the nations.

The Study of Irrigation as an Applied Science.

Irrigation is, however, in its infancy in Australia, both as a business and as an art, and in view of the great water conservation works which have recently been, and are still to be, carried out, and the large areas of good irrigable land that have been made available for settlement in this country, it is very desirable that intending settlers should have every possible opportunity of studying it from both aspects before embarking their capital. The fact that irrigation colonies like Mildura and Renmark have made good largely through the efforts of new-chums, or men who had little or no experience before they first took up land, may lead others to think that a sufficient knowledge of practical irrigation may be casually picked up without any regular training. So it may, doubtless, by men of energy and brains, just as a knowledge of the trade of a carpenter or a blacksmith, or a saddler may be picked up, or of the profession of a surveyor or engineer; but the man who casually picks up a trade or profession is always at a disadvantage as against the man who has gone through a regular course of training, and it must be remembered that many of the men who took capital to Mildura and Renmark in the early days of those settlements, lost their money and pocketed the loss. It must also be borne in mind that many of the most successful men in Mildura and Renmark to-day began by losing their money, and had to make a fresh start after learning their business through hard years of practical experience before attaining their present comfortable circumstances.

Regular training is more necessary to the irrigationist than to those engaged in other agricultural pursuits, because :—

(1) Though his profits may be larger in proportion to his invested capital, and more certain than those of farmers whose crops depend on the rainfall, the irrigationist has to spend a larger amount annually to get those profits, and it is of the first importance that he should learn to spend that money wisely.

(2) The irrigationist has less previous experience to fall back upon than those engaged in most other rural occupations.

(3) The technical knowledge that he needs is more varied in character and covers a wider field.

The value of the training that is available at institutions like the Hawkesbury Agricultural College and the Yanco Experiment Farm is obvious, and will doubtless do much to remove the mark of the "amateur," at present so characteristic of a large proportion of the irrigators on our new areas. But the introduction of a regular apprenticeship system—towards

which some attempt has already been made—on commercially profitable farms, either in Government or private hands, would, in the opinion of the writer, do even more to place the occupation of the irrigationist on an educational level with other trades and professions, and would give him the advantages which those who have served their time or articles in them enjoy.

The Cost of Establishing an Irrigation Farm and the Profit to be made from it.

The first thing the intending irrigation farmer thinks of is what his farm will cost him before it begins to pay, and what he will be able to make out of it afterwards. What it *ought* to cost the average settler is very easy to find out, for contract prices for different classes of work, though they may vary slightly in different districts, are well known, and the Government Irrigation Departments in the different States have been at some pains to make and tabulate careful estimates of the capital an irrigation farmer is likely to require. What it *actually does cost* the irrigation farmer to bring his property into profitable bearing is sometimes a very different matter. The reasons for this are not far to seek.

In the first place it takes at least three years to make an irrigation property pay, and during that time it runs certain risks of set-backs from thunderstorms, heat-waves, frosts, and so on, and capital must be provided against these risks under the heading of *contingencies,* which may fairly be reckoned at 25 per cent. of the estimated cost. In the second place, many settlers go in for irrigation farms without any knowledge of the business, which has to be learned like any other. Naturally they have to pay for their experience.

Perhaps the most reliable guide as to *what is to be made out of an irrigation farm* is the actual average profit that has already been made through a series of years in a large district. Estimates are very useful, but are only estimates when all is said, and the following figures recently presented to the Fruit Commission by Mr. J. J. Lever (Chairman of the Mildura Co-operative Company), showing average cost of production and actual average profit in growing currants, sultanas, and lexias, in Mildura over a period of eight years, will serve excellently both as a guide and as a warning.

MILDURA VINE PRODUCTS.—Eight Years' average value (1906–14).

	Average payments per ton.	Average Yield per Acre.	Average Value per Acre.	Value less £8 per Acre for cultivation, &c.	Cost of Drying at £6 per ton.	Nett Value per Acre.
	£ s. d.	Tons.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Currants	34 0 6	1·04	35 7 8	27 7 8	6 4 9	21 2 11
Sultanas	39 8 9	0·79	31 3 1	23 3 1	4 14 9	18 8 4
Lexias	21 3 8	0·77	16 6 2	8 6 2	4 12 4	3 13 10

No allowance is made in these figures for manuring, sulphuring, or interest on capital.

Mr. Lever subsequently informed the Commission that the cost of manuring, sulphuring, interest on capital, and depreciation of plant might be put down at £7 per acre;* this brings the nett average value of the fruit per acre to:—

	£	s.	d.	
Currants	14	2	11	Profit.
Sultanas	11	8	4	„
Lexias	3	7	0	Loss.

The basis of Mr. Lever's figures for average net cash values of these products is what his company—the largest co-operative company of growers of dried fruits in Australia—has been able to pay its own shareholders for the fruit in the sweat-box, and may be taken as absolutely sound.

It is thus apparent that while the average 10-acre block in Mildura, planted with sultanas, has during the past eight years been yielding an income of £234 3s. 4d. besides 5 per cent. interest on capital, to a grower working his own land, and whose work has been worth 8s. a day (counting 300 working days in the year), and the average 10 acre block planted with currants has been yielding an income of £261 9s. 2d., besides 5 per cent. interest on capital to such a man—the average 10 acre block planted with Gordo Blanco has been worked at an annual loss of £33 10s.

These figures make the necessity of care and judgment in selecting varieties of fruits for planting very evident, besides ascertaining the extent and stability of the market for each product.

The Value of Co-operation.

Co-operative methods of dealing with and marketing produce are nearly always desirable and advantageous to the rural producer, but in the case of the Australian fruit-grower and irrigationist they are not merely desirable, they are necessary to his very existence. This will be very evident to anyone who knows the Murray settlements and their history. It is to those settlements that Australia owes her first practical and profitable examples of successful irrigation farming, but without co-operation they would long ago have ceased to exist as such. The Australian Dried Fruits Association, which

* The figures given for cost of production might be given in more detail as follows:—

	Per Acre. £	s.	d.
Cultivation, pruning, &c.—(Usual contract rate)	6	0	0
Water and Shire rates	2	0	0
Cost of drying at £6 per ton for currants, and £7 5s. 0d. a ton for sultanas and raisins, approximately	6	0	0
Manure, including freight and cost of sowing...	1	15	0
Sulphuring	0	10	0
Interest on capital at 5 per cent. per annum.—(Taking value of unplanted land at £10 per acre, and cost of planting and bringing into bearing at £60 per acre)	3	10	0
Interest and depreciation on drying plant at 5 per cent.—(Allowing £5 per acre for value of drying plant, and putting the life of a tray at 8 years	0	17	6
Interest and depreciation on other plant	0	7	6
Total average cost of production per acre	21	0	0

represents practically the whole of the dried fruit producers of this country, has been built up by the steady co-operative effort of growers for the past twenty years, and has been successful in placing that industry on a thoroughly sound basis. To this association the commercial success of Mildura, Renmark, and the smaller settlements of the Murray is primarily due, and on it and similar associations the commercial success of new and future settlements is likely to depend.

Water Supply.

The most reliable evidence as to the amount of water required by an irrigation farmer in the dry areas of Australia, is to be obtained from the experience of the settlers of Mildura and Renmark, the two oldest, and hitherto most successful irrigation settlements in the continent. The average water supply available in Mildura is 6,700 cubic feet* per minute, with which 10,000 acres are irrigated in an average of 36 days. This is equivalent to 1 cub. foot per minute per $1\frac{1}{2}$ acres, or $251\frac{1}{4}$ gallons per acre per hour, enabling the area to receive an irrigation of 8 acre inches in 36 days (day = 24 hours), allowing for the loss of 1 acre inch through evaporation, &c. Great things have been done in Mildura on this water supply, but it has been found rather less than could be desired for fruit-growing in times of great heat and drought, and inadequate for lucerne growing on a commercial scale. The supply in Renmark is 1 cub. foot per minute for every $1\frac{1}{4}$ acres, or about 300 gallons per acre per hour, enabling the area to receive 8 acre inches in 30 days (day = 24 hours), allowing for the loss of $1\frac{1}{2}$ acre inches through evaporation, &c. The Renmark supply is generally considered all that is necessary for fruit growing, but 1 cub. foot per minute to the acre, enabling similar areas to receive 8 acre inches in 24 days (allowing for loss of $1\frac{1}{2}$ acre inches), may be set down as the supply desirable for that purpose, leaving an ample margin for times of stress. From three to five irrigations (of 6 to 8 acre inches each), according to the season, take place in the above-named settlements. Anything up to 2,000 acres of hay crops are put in and irrigated in Mildura in addition to the 10,000 acres above-mentioned, and require at most an irrigation in March and another in September.

For successful lucerne growing, fully double the amount of water required by a fruit-grower is necessary to get the best results, and the available supply to be desired may be set down at from 2 to $2\frac{1}{2}$ cub. feet per minute per acre, enabling an area to receive 8 acre inches (an acre inch allowed for loss) in from 10 to 12 days.

An Irrigation Farm as an Investment.

The man who goes in for irrigation in Australia with the idea of making a large fortune quickly is on the wrong track. It may be done perhaps, but it may be done more easily in other ways. The man, on the other hand, who is satisfied with a healthy country life, a pleasant occupation, and a better return on a small capital than is likely to be made in any other rural

* 3,630 cub. feet = 1 acre inch.

industry, can hardly do better than go in for an irrigation farm in country such as that available in the Murrumbidgee Areas of New South Wales, where there is good land and an ample water supply at a reasonable price, if he takes the trouble to get a little experience and knows what he is about. I have spoken of risks, and risks there certainly are, but most of them can be provided against; in any case, they are less than those which attend other rural occupations, for the greatest risk to all Australian industry, drought, is eliminated.

The aim of the articles which follow will be to bring within the reach of anyone who can read and write and work out simple sums in arithmetic, the elementary knowledge which an irrigation farmer needs in Australia. Much of it has not hitherto been obtainable in a convenient form, and some of it only in highly technical works.

The subjects treated will be: The choice of a site and soil for an irrigation farm; the use of the dumpy-level, chain, and compass; laying out a farm for irrigation; grading and channel-making; pegging-out and planting; the use and abuse of irrigation water; what to plant; pruning; cultivation and manuring; harvesting.

THE CHOICE OF A SITE AND SOIL FOR AN IRRIGATION FARM.

In choosing a site and soil for an irrigation farm to be planted with fruit, lucerne, or crops, the following are the chief points to be considered by the grower.

(1) *The quality, class, and depth* of the soil, and its suitability for the particular fruit, fodder, or grain to be planted.

(2) *The grades and levels of the land*, and its suitability for the application of water and for drainage.

(3) *The aspect of the land*, and its situation.

The qualities of soil (which depend on the presence in sufficient quantities of potash, nitrogen, phosphoric acid and lime, and the absence of magnesia and other harmful salts), have a well known and excellent index in the size and quality of the prevailing native timber, in accordance with varieties of which soils are very generally classified. Soil which produces large free-growing native grasses may usually be depended upon for valuable products under cultivation, while that on which timber is sparse and stunted is generally poor, and will need much manure at all events, if good results are to be obtained from it. The size, not so much of the timber generally is to be taken into account, as of the individual variety or varieties which may be considered characteristic of the country.

The practice of irrigation is confined as a rule to areas of small rainfall, and in Australia it will be mostly in mallee, Cypress pine or box country that the irrigation farmer will look for land. Excellent soil for fruit and lucerne-growing with irrigation will be found under all these timbers, and is

easily recognisable by their size and quality. In the mallee, for instance, there is no chance of mistaking land where the timber is large enough to make good posts and rails, and the roots protrude from 18 inches to 3 feet from the surface, for the poor soil, perhaps adjoining it, covered with whip-stick and spinifex. Poor soils in box or in pine country can always be recognised by the crooked, stunted, close-grained trees, and where they grow on good soil these timbers will be found with large straight trunks, free in the grain.

Bushes, shrubs, and herbs also afford indications of the value of a soil, as where saltbush, bluebush, or pigface is found, salt, which has been fatal to many plantations, may be expected to rise to the surface after repeated waterings; while on land on which hop-bush and wattle grow, may usually be counted upon as good fruit-growing country.

But though it may be known that a soil is good, it does not follow that it will be equally good for anything one may choose to grow upon it; good vineland may not be suitable for citrus fruits, and so on; and unless there is sufficient evidence, from the inspection of neighbouring fields or gardens, if there be such, of its suitability or unsuitability for the purpose in view, an analysis of its chemical constituents, and the advice of the agricultural chemist, as to the suitability for the fruit, grain, or fodder, to be grown, should be obtained. The proper method of taking samples of soil for analysis may be obtained from the Department of Agriculture.

Depth of surface-soil is of the first importance, particularly to the fruit-grower, and holes should be dug to ascertain it; for it is from the surface-soil that a fruit tree or vine derives most of its food; where it is shallow the roots will all extend close to the surface, and will be constantly checked and injured by necessary cultivation, while in a deep surface-soil the destruction of surface roots is of no consequence, as others will shoot out to take their places lower down, where the plough and cultivator do not reach. A deep surface-soil of moderate quality is to be preferred for fruit-growing under irrigation to a richer one which is shallow, for in the former the roots will have a larger wetted body on which to feed, the fertility of which may be artificially increased. A tree must have room to grow below ground if it is to grow well above.

The qualities to be looked for in *a good subsoil* are negative rather than positive. Great fertility is not generally to be expected, nor is it necessary if the surface-soil is rich and deep. It should be ascertained, however, that the subsoil is free from alkali, that it is sufficiently friable for roots seeking moisture to penetrate, and sufficiently porous to allow water to pass through it. A stiff clay subsoil that holds water like a bottle is always likely to give trouble. A limestone subsoil has the advantage of affording excellent drainage, but in some cases it lets the water away too quickly, and consequently requires more frequent and sometimes more copious irrigations than are generally necessary. A limestone subsoil is advantageous if not too near the surface, but sand alone, or a mixture of either sand and clay, or sand,

clay, and gravel is better. Some of the best fruit-growing land on the Murray is to be found in box country, consisting of a rather heavy clay loam to a depth of 3 or 4 feet, with a subsoil of pure white sand.

The class into which a soil falls with regard to its texture also needs consideration. Generally, light loamy soils, though not light enough to drift easily, are to be preferred to stiff clays for growing vines, citrus, and stone fruits, being much less expensive to work, not needing the heavy dressings of lime and gypsum so often required by clay lands, and more easily absorbing applied water and manure. On those clay flats, however, to be found on river banks, or wherever successive deposits of vegetable or other valuable matter have enriched the land, it will pay to loosen up the surface with lime or gypsum, which besides lessening the difficulties of cultivation and moisture conservation, makes the required plant food more readily available. Where lime or gypsum is too expensive, sand buck-scraped over the surface, will be found an excellent substitute if obtainable, preventing all baking and cracking, making the land easier to cultivate, and helping to conserve the moisture underneath.

For lucerne growing there are fewer objections to a heavy soil if the surface-soil is rich and deep, and it is not separated from the subsoil, as sometimes happens, by a band of impervious clay, because as the surface of land under lucerne is less exposed to the sun, it is not so liable to bake and crack after an irrigation, and a heavy soil if rich enough is sometimes preferable to light loams for this purpose, being stronger and less liable to leach, and consequently requiring less manure. The roots, too, of the lucerne plant have far more penetrating power than those of fruit trees, and themselves loosen up the land to a great depth.

(2) *The grades and levels of the land* and their suitability for the distribution of water and of drainage.

A rough contour plan of the levels of a piece of land should be obtained and studied before it is selected, for the difficulties of laying out a farm for irrigation are not always evident from observation of the surface, and apparent obstacles may not in reality exist; then again, though a farm may be difficult and expensive to lay out, it may be very desirable in other respects, the expense may be worth while, and the difficulties overcome. Methods of dealing with such land will be indicated in a succeeding chapter.

Gentle and regular slopes will be found most suitable for fruit growing. Land which is covered with hillocks and hollows and requires much grading, *i.e.*, scraping the soil from the hillocks to fill in the hollows, thus making the grades of the surface more or less even—is to be avoided. Low-lying land, which is nearly or perfectly level, though often suitable for lucerne, is likewise undesirable for fruit growing, unless there is good natural drainage from the subsoil; so is a block which slopes towards its centre, or one which receives soakage from land surrounding or adjoining it.

(3) *The aspect of the land and its situation*

An aspect which faces the rising sun is nearly always to be preferred by a fruit-grower, particularly by a vigneron, and in districts where late frosts occur. In the inland irrigation areas the damage done in orchards and vineyards by heavy spring frosts to bursting buds and young leaves, and to setting fruit, is very rarely, if ever, due to the effect of mere cold. This will be evident to anyone who has remarked that if the sky becomes overclouded at sunrise a frost does little or no harm. The damage is caused by the sudden thawing, or literally burning, of the frozen buds by the sun's rays, and the higher the sun has risen, and the more vertical its rays become before they strike them, the more the buds, or tender leaves, or setting fruit will be scorched.* Where, however, the land faces the early morning sun, the first rays of which strike the trees or vines almost horizontally, the thawing is gradual, and little or no harm results.

Besides, having little to fear from frosts, the grower whose area has such an aspect, can depend on getting a much better setting of fruit on his trees or vines than one whose property faces in another direction. Many varieties of vines, and some trees, have a strong tendency to shed their fruit while it is forming in the flower, and even after it is formed. This shedding (sometimes wrongly put down to disease), which may deprive a grower of half his crop, is in many cases brought about, like the damage done by frost, by a sudden change of temperature. If, on a warm day following a cool night, the sun's rays do not strike the vine and the earth and air around until late in the morning when the sun has risen to a height and its heat has become intense, the sudden warmth brings up a rush of sap from the roots, which causes the newly-formed fruit to drop off. Where vines get the sun early, on the other hand, and the change in temperature is gradual, the sap rises slowly from the roots, and the fruit does not fall.†

Besides having the right aspect an orchard or vineyard should be well situated in other respects, particularly with regard to protection from prevailing winds, which often do much damage. If the land chosen has no natural protection on the north, west, and south sides, wind breaks may be planted to afford it; but nothing should screen it from the horizon on the east.

(To be continued.)

* I have been informed by Mr. W. J. Allen that, in certain districts near the coast, fruit trees, planted on land with a westerly aspect, and consequently shaded from the early morning sun, have been found to be less liable to damage by frost than those planted in land with an easterly aspect. It is obvious that in such cases the warmth of the morning air must be sufficient to slowly thaw the frost on the trees *in the shade* before the sun reaches them. I have not heard of a similar instance in the inland irrigation areas.

† Cincturing is frequently practised to prevent this shedding of the immature grape, by checking the sap flow, and in the case of the currant vine meets with great success. But many varieties of vines do not take kindly to the cincture, and in a vineyard with a favourable aspect it is unnecessary, except in the case of the currant vine.

Notes for Maize-growers.

THE following papers by the inspectors of agriculture stationed in the districts in which maize is extensively grown are designed to indicate to farmers the importance of commencing the preparation of the land at an early date, if indeed that has not already been done. There is not a district in the State—not even the North Coast—where the rainfall is heavy and consistent enough to justify maize-growers in relying exclusively on the moisture that is precipitated during the growing period, and the greatest advantage of winter rains can only be taken by ploughing early to catch the whole of each fall, and cultivating the surface so as to conserve what is absorbed.

The selection of the varieties most suitable for the different districts and different purposes for which maize is grown is a matter of no less importance, and farmers will find that observance of the recommendations is likely to redound to their own profit.

THE NORTH COAST DISTRICT.

G. MARKS, Inspector of Agriculture.

THE varieties of maize that can be recommended for the Northern Rivers district are Improved Yellow Dent for main season, and Leaming for early planting. During recent years numerous varieties have been tested on the Farmers' Experiment Plots, but so far the above have invariably given the best results. For poorer soils on higher lands, which are not usually utilized for maize, Hickory King can be recommended. For green fodder or ensilage Improved Yellow Dent is best.

For ensilage purposes the greatest yields are obtained by planting in November and December, because the early autumn rains then ensure a good growth. Maize is not as largely used as it should be for green fodder or ensilage, owing principally to the fact that the pastures on the North Coast in normal seasons usually provide feed for the greater part of the year. Late plantings, say in January and February, however, will provide succulent feed well into winter where frosts are not too frequent or severe. For dairy herds, maize should be planted early in the spring, say the latter end of August in the warmer parts and also in September, in order to provide good supplies for the early summer when pastures often suffer from short periods of dry weather. The plantings should be made in drills about 3 feet apart, and at the rate of 20 lb. per acre. This method permits of seasonable cultural operations being carried out regularly. On irregularly shaped areas adjacent to creek frontages broadcasting may be resorted to.

Land intended for grain crops should receive the first ploughing early in winter, and be allowed to lie in its rough state for weathering agencies to carry out their work. This also has the effect of sweetening low-lying lands that have been subjected to saturation during the late autumn months. Heavy retentive soils are particularly benefited by this early ploughing, especially if the district be favoured with a few heavy frosts. Where practicable, efforts should be made to adopt a rotation. The presence of leaf blight, maize smut, and other diseases renders this advisable There are everywhere indications that maize lands are becoming what may be termed maize-sick, owing to this crop being planted year after year without rest or change Where vetches or field peas have been planted for green manuring, the fields may be left till, say, the latter end of July before ploughing under.

For the production of grain, from 4 feet to 4 feet 6 inches are the favoured distances between the drills, and the seed should be planted at the rate of 10lb. per acre. Should the seed be weevily, an extra amount should be planted to compensate for misses.

In the warmer districts early plantings may be made in late August, but, as a rule, September is the best month, and there is less risk of losses from an occasional late frost. The rainfall on the coast is so erratic that it is really impossible to rely solely on any particular month to ensure the best growing season. It is, however, advisable to arrange the plantings in sections, with intervals of a few weeks between each. By this means all the plantings will not suffer alike should a dry, hot spell be experienced at "cobbing" time. Instances have repeatedly come under notice where the whole of a farmer's crop has been light through the area having been all planted at once, and unfavourable weather supervening at the critical tasselling period.

Where low-lying lands on the lower reaches of the rivers are being cropped, it is generally advisable to resort to September planting. This usually enables the crops to be harvested before the autumn heavy rains, with possible floods, set in.

A good germination is most important. Every effort should be made to have the land well prepared some weeks before it is intended to sow. Then, with the first favourable weather, plantings can go on apace without a commencement having to be made with the initial ploughing.

THE CENTRAL COAST DISTRICT.

J. W. SHAW, Assistant Inspector of Agriculture.

THE time is at hand when farmers who each year plant a given area of their farms with maize should devote their attention to the first, and certainly one of the most important, operations connected with the growing of the crop, namely, the first ploughing. Every effort should be made to have every acre that is to be cropped deeply and thoroughly ploughed without delay. On

land which was under maize last season, and which it is intended to crop again this year, many farmers will delay the ploughing and allow their stock to take advantage of the feed which is always present, more or less, amongst the dry stalks in coastal districts. Such a practice is not a good one, as much more harm is done by the tramping of the soil (which at this period of the year is usually in a very moist condition) than is gained by the stock in the way of feed.

As regards the best implement, both disc and mouldboard are commonly used and each type has its advantages, but generally speaking the latter will be found to do the best work, for it buries the weeds, grass, and other rubbish which are always present more or less at this time of the year. The disc plough, while doing very good work, cannot be compared with the mouldboard in the matter of covering weeds, rubbish, &c. If there is much of these on the land, a drag chain attached to the plough will greatly assist in getting the material thoroughly turned under. After ploughing, the soil should be allowed to remain in the ploughed state to permit the air, sun, frost, and other agencies to act upon it, all of which have a wonderfully mellowing effect. After the soil has been ploughed for some weeks it should be cross ploughed to a depth of about 4 inches, or perhaps a cultivation with the spring-tooth cultivator would be just as effective. After the cultivation or second ploughing, a harrowing may be required, but under normal conditions, land treated in the manner described should work down into good tilth in readiness for planting.

Although comparatively few trials have as yet been conducted in the central coastal district, the yields obtained up to the present appear to favour comparatively late maturing, rather than early maturing varieties. As the character of the season is an important factor in determining which varieties will yield best, it is difficult to make definite recommendations on the results of one or two seasons. Improved Yellow Dent is a variety which has done well wherever it has been tried in the central coastal district, both for green fodder and grain. It is late in maturing, but produces a large grain of very attractive appearance. Another variety which has done well is Red Hogan, a midseason to late variety with red grain, which is very suitable for either green feed or grain. Leaming, another midseason variety, although yielding well, has not come up to the two first mentioned sorts.

Owing to the fact that cross fertilization is so common with maize, it is not recommended that farmers should grow more than two varieties, and even then it is necessary that one should be comparatively early in maturing and the other late, so that they will not both be in tassel at the same time. Of the early maturing types, Funk's Yellow Dent has given good results for grain, but it cannot be considered a suitable variety for green feed or ensilage. A variety which has given good results for green feed is a white maize known as Hickory King. It produces a large amount of leaf, grows to a fair height, and appears to be very suitable for poor soils. The writer has seen good yields obtained from Hickory King on land which at first sight would be considered too poor to grow maize.

The time of planting is another very important factor to be considered. While some growers plant as early as August, such a practice cannot be considered a sound one, as heavy frosts are frequently experienced until the very end of the month. Plantings may be commenced, say, any time after the first week in September, and may be continued until the second or third week in December. As a rule November and December plantings have proved the most successful, as then the crop usually catches the early autumn rains when it is at its most critical stage, namely, "cobbing." September and October plantings sometimes suffer severely at the "cobbing" stage, for the months of November and December almost invariably prove dry and as a result the maize suffers at a time when it very much needs moisture. As regards the methods of planting, single grains 12 to 15 inches apart or hills 2 feet 6 inches to 3 feet apart, the latter method is preferable, as it enables weeds which grow between the plants in the drills to be dealt with more effectually. The amount of seed per acre is dependent upon a number of factors, such as the fertility of the land, rainfall of the district, variety, &c., but for grain it ranges from about 8 lb. to 12 lb. per acre, and for ensilage from 15 lb. to 20 lb. Under all conditions sowing in drills gives the best results; when planted for green feed the drills should be about 3 feet or 3 feet 6 inches apart, and for grain about a foot wider than this.

THE SOUTH COAST DISTRICT.

R. N. MAKIN, Inspector of Agriculture.

It is a difficult matter to find a pure strain of any variety of maize on the South Coast. Most farmers have neglected maize growing in favor of dairying, which has proved more remunerative, but since Farmers' Experiment Plots were started on the coast interest has been created in several varieties of maize that have returned satisfactory yields for green feed, ensilage and grain.

Many varieties have been tested, and in the fodder section the most satisfactory returns have been obtained from Improved Yellow Dent. This variety, which was unknown on the coast six years ago, has now become very popular. In the matter of maturity it comes between the early and late varieties, and has cut over 40 tons of green stuff per acre when sown in drills 3 feet apart.

Boone County Special is also a suitable variety for green feed. Although it has not yielded such high returns, the results have been very satisfactory; it is a little earlier in maturing than Improved Yellow Dent. Boone County Special is fast becoming popular as a yielder of payable crops of good quality grain. The grain is white; unfortunately there is a prejudice in some quarters on account of the color, but this is absurd for, as regards the feeding value, there is no difference between the different colors of the Dent varieties.

Funk's Yellow Dent has proved a very profitable variety for grain, and is popular in the Moruya district. It is noted for its long cobs, well filled tips and butts, and fine core.

There is now a tendency, on the part of farmers in most districts to pay more attention to the purity of their crops. There is a strong demand every season for good quality grain, and always at a fair price. A great deal may be done when pulling the crop by selecting for seed purposes ears from stalks showing some character. The ears, of course, should be as near perfection as possible. The points most to be noted are that the husk protects the tip from weather, birds, &c., that the ear is cylindrical in shape, the butt and tip well filled, the rows regular without spaces between them, and the grain long, wedge-shaped, and not pinched.

In shelling, it is advisable to chop off from the tip all undersized grain, and when it comes to sowing with the maize planter it is advisable to "butt" the cobs, as the irregular shaped grains generally found at the butt, although capable of growing a good stalk, are a nuisance in the seed hopper, often causing misses in the rows through jambing in the plate.

THE NEW ENGLAND AND NORTH-WEST DISTRICTS.

F. DITZELL, Assistant Inspector of Agriculture.

THE maize districts of New England and the North-west may be classified as follow:—(*a*) Inverell and Delungra, (*b*) Tenterfield, (*c*) Glen Innes, (*d*) Armidale and Uralla, (*e*) Tamworth and Quirindi.

The first three districts all grow considerable quantities of maize, while a fair amount is grown in the Armidale and Uralla district, and very little at Tamworth and Quirindi, where it is almost too hot and dry for maize. Except to a very limited extent under irrigation along the Namoi river, mainly in the neighbourhood of Gunnedah, maize is not grown elsewhere in the North-west.

The varieties recommended for cultivation in the various districts are as follow:—

(*a*) Inverell and Delungra: Early Yellow Dent, Funk's Yellow Dent, Reid's Yellow Dent, Improved Yellow Dent, Riley's Favourite, Leaming, Cornplanter, Boone County Special, and, for the lighter upland soils only, Hickory King.

(*b*) Tenterfield: Early Yellow Dent, Funk's Yellow Dent, Reid's Yellow Dent, and, to a limited extent, Boone County Special, Hickory King, and Leaming.

(*c*) Glen Innes: Early Yellow Dent, and, to a limited extent, Funk's Yellow Dent and Reid's Yellow Dent.

(*d*) Armidale and Uralla: Early Yellow Dent, Funk's Yellow Dent, Reid's Yellow Dent, and, to a limited extent, Boone County Special and Hickory King.

(*e*) Tamworth and Quirindi: Early Yellow Dent, Funk's Yellow Dent, Reid's Yellow Dent, and, to a limited extent, Boone County Special, Hickory King, and Leaming.

Under irrigation in districts too hot and dry for the ordinary cultivation of maize the following varieties should give good results:—Early Yellow Dent, Funk's Yellow Dent, Reid's Yellow Dent, and, to a limited extent, Boone County Special, Hickory King, and Leaming.

The following notes on the varieties named will assist growers in choosing the best for their particular districts:—

Early Yellow Dent: This is an early maturing variety with thin stalks, especially suitable for the tableland districts with short growing seasons, also for the hot, dry districts. In the intermediate districts, such as Inverell and Delungra, it is a good main crop variety, but it is especially suitable for the production of an early crop to be followed by wheat, or for late sowing; under the latter conditions it will generally ripen before frosts occur.

Funk's Yellow Dent: This is a splendid medium early variety for main crop sowing in all the above districts except Glen Innes, where it should only be sown early or it may be caught in an immature stage by frosts.

Reid's Yellow Dent: The same remarks apply to this variety as to Funk's Yellow Dent, except that so far it has not given such high yields.

Improved Yellow Dent: This is a medium early maize that has given very good results in the Inverell and Delungra districts.

Riley's Favourite: This is a midseason variety, very suitable for main-crop sowing in the Inverell and Delungra districts, but it does not mature quite early enough for the tableland or hot, dry districts.

Leaming: A tall-growing, midseason variety, and a heavy yielder, Leaming is only suitable for main-crop sowing in the Inverell and Delungra districts; it does not mature quite early enough for the tableland districts, excepting Tenterfield, where it should be sown early in order to avoid frosting.

Cornplanter: A white variety which ripens between Funk's Yellow Dent and Leaming. This has proved a good main-crop variety in the Inverell and Delungra districts.

Boone County Special: This is a white variety of about the same season as Cornplanter, suitable for main-crop sowing in the Inverell and Delungra districts, and for limited sowing in the other districts, excepting Glen Innes, where it does not generally ripen quickly enough.

Hickory King: This is another white variety of about the same season as Cornplanter and Boone County Special, suitable for the lighter red soils in the Inverell and Delungra districts and limited sowing elsewhere, except in the Glen Innes district, where the same remark applies as to Boone County Special.

THE IRRIGATION AREAS.

R. W. McDIARMID, Assistant Inspector of Agriculture.

The early spring and mid-summer trials of maize for grain, conducted during the past seasons, show that maize can be successfully grown on the Murrumbidgee Irrigation Area on suitable land. The heavy clay which predominates is not suitable, and only the soils of a sandy, loamy, and rich nature are satisfactory. The early spring sowing yields good grain, but not of the same quality and quantity as the mid-summer sowing. The great drawbacks with early spring sowing are the severe wind and extreme heat which predominate at the period when the plants are "cobbing." This difficulty may be overcome to a certain extent with the aid of wind-breaks or shelter belts and by restricting sowings to the deep sandy loams which absorb large quantities of water at each irrigation. The land must be kept moist throughout the growth of the crop.

Better results will invariably be obtained by sowing the seed during the latter part of December, for the winds ease and the weather cools during March and April, and the climatic conditions generally are better suited to good fertilisation and the development of the grain. The moisture in the soil may also be more easily maintained, and rain is also more likely to fall to assist proper development.

The quick-maturing varieties are more successful for grain production, while the late varieties yield the heavier for green feed.

The following varieties have yielded best for the various purposes mentioned:—

For grain: Funk's Yellow Dent, Early Yellow Dent, Boone County Special, and Hickory King.

For green feed: Yellow Dent, Red Hogan, and Golden Nugget.

Dual purpose varieties: Red Hogan and Boone County Special.

The distance between the rows is most important, and should be governed by the object in view. For grain production, from 4 to 5 feet is necessary, while for green feed 2 to 3 feet. For wide sowing, it is necessary, in all soils, except those of a sandy nature, to irrigate by means of two furrows between each row, as otherwise the land is not thoroughly soaked in the limited time available. With a season like the past, it is necessary to water every fortnight and in some cases more often if possible.

Dairy Cattle Rations.

M. A. O'CALLAGHAN.

WHEREAS the dairying districts proper in New South Wales may be said to have had an excellent season, still the outlook for the winter is not too promising. We have had an extremely dry autumn so far in the Richmond and Tweed River districts, and it is from this portion of the State that we generally derive the bulk of our winter butter supply; therefore, unless something of an unforeseen character occurs, we shall see a scarcity of butter even in New South Wales, and consequently higher prices. Under the circumstances, even some of the farmers on the coast will, no doubt, see their way to hand-feed cattle pretty fully, using of course mostly farm-grown foods.

Speak'ng generally, the quantity and quality of food which a cow should receive will depend to a great extent on what that cow is doing. A dry cow, if not very forward in calf, can do with very rough fodder; and such cows do well on our rough pastures, even in winter, provided there is abundant shelter. Cows in full milk, on the other hand, require not only plenty of food but food of the best quality, if the very highest results are to be obtained. Stimulating foods like grain are necessary in conjunction with bulky foods, such as grass, maize, sorghum, &c. The cheapest and happiest combination for ordinary cattle feeding is a combination of lucerne hay and maize, with some bran. Lucerne hay supplies a good deal of the bulk which every dairy cow requires in her food, as it takes up a great deal of water, and increases in bulk after having been taken into the stomach. Maize meal or crushed maize is also very useful, as it not only helps to give a variety, but it also aids in keeping the condition and energy of the cow up to the standard.

The rations given below are all for cows of average size, say 1,000 lb. live weight, and for animals that are in full milk. The rations have sufficient variety to meet the requirements of the town as well as the country dairyman. In addition to the substances mentioned in these rations, I can strongly recommend the use of molasses in conjunction with chaff of any kind. It is especially useful in connection with lucerne chaff, as it increases the amount of carbohydrates, and also adds to the palatability of the fodder.

Regarding the water which a dairy cow will require, this depends on the season of the year, the size of the cow, the quantity of milk she is giving, and the character of the food supplied. If a cow is giving 5 gallons of milk a day in the summer, she will probably want at least 15 gallons of water. If a cow is hand-fed, and dry food such as lucerne hay is used, she will require a still greater quantity during the warmer months. Cows giving small yields require less water, but 10 gallons may be put down as a normal amount for a dairy cow in ordinary weather on grass. The water should be

the purest possible, so that the animal may be induced to drink a considerable quantity. A deficiency in the water supply means a deficiency in the milk supply.

Salt should also be provided, rock salt for cows to lick being best.

DAILY RATIONS SUITABLE FOR COWS IN FULL MILK DURING WINTER OR IN A PERIOD OF DROUGHT.

	Dry Matter.	Protein.	Carbohydrates.	Fat.
1.	per cent.	per cent.	per cent.	per cent.
30 lb. maize ensilage	6·30	·27	3·43	·18
10 ,, millet hay	9·13	·41	5·04	·10
4 ,, oats	3·56	·33	1·78	·16
7 ,, bran	6·16	·88	3·08	·20
51 lb.	25·15	1·92	13·33	·64
Albuminoid ratio... ...	1 : 7·6.			
2.				
30 lb. maize ensilage	6·30	·27	3·43	·18
15 ,, lucerne hay	13·74	1·14	5·67	·19
6 ,, bran	5·28	·75	2·64	·17
2½ ,, corn	2·23	·18	1·57	·10
53½ lb.	27·55	2·31	13·31	·64
Albuminoid ratio	1 : 6·3			
3.				
25 lb. mangels	2·27	·21	1·52	·05
15 ,, lucerne hay	13·74	1·14	5·67	·19
1 ,, cotton-seed meal	·91	·36	·18	·12
4 ,, bran	3·52	·50	1·76	·11
5 ,, corn meal	4·32	·35	3·30	·17
50 lb.	24·76	2·56	12·43	·64
Albuminoid ratio	1 : 5·4			
4.				
25 lb. fresh brewers' grains ...	5·97	·97	2·47	·32
20 ,, lucerne hay	18·32	1·52	7·56	·26
3 ,, corn meal	2·59	·21	1·98	·10
48 lb.	26·88	2·70	12·01	·68
Or using 4 lb. corn meal ...	27·74	2·77	12·67	·72
Albuminoid ratio... ...	1 : 5 and 1 : 5·1.			
5.				
20 lb. pumpkins	4·20	·08	1·42	·02
10 ,, lucerne hay	9·16	·76	3·78	·13
10 ,, oaten chaff	9·11	·42	4·27	·15
6 ,, bran	5·28	·75	2·64	·17
2 ,, cocoanut cake	1·82	·72	·36	·26
48 lb.	29·57	2·73	12·47	·73
Albuminoid ratio... ...	1 : 5·1.			
6.				
20 lb. pumpkins	4·20	·08	1·42	·02
10 ,, chaffed corn stalks	5·99	·20	3·34	·06
10 ,, lucerne hay	9·16	·76	3.78	·13
1 ,, cocoanut cake	·92	·13	·32	·16
6 ,, bran	5·28	·75	2·64	·17
2 ,, corn meal	1·72	·14	1·32	·07
49 lb.	27·27	2·06	12·82	·61
Albuminoid ratio... ...	1 : 6·8.			

With reference to the constitution of the various rations given:—

In ration No. 1, oaten hay or wheaten hay may be substituted for millet hay, and the oats should be crushed before being fed.

The corn in ration No. 2 should be crushed and the lucerne hay may be chaffed, but not cut too small. The lucerne chaff, corn and bran should then be mixed together, moistened with water, and fed to the cows.

With regard to ration No. 3, cocoanut oil cake or linseed oil cake can be substituted for the cotton-seed meal.

Ration No. 4 is only suitable for dairies in cities or country towns adjacent to a brewery.

Two Methods of Tanning Fur Skins.

The Department is sometimes asked for recipes for tanning fur skins, and the following was supplied to a recent correspondent as what is called a "lightning process":—

Cut off the useless parts of the skin, and then soften it by soaking, so that all flesh and fat may be scraped from the inside with a blunt knife. Soak the skin next in warm water for an hour, and during that time mix equal quantities of borax, saltpetre, and Glauber salts with enough water to make a thin paste. About half an ounce of each ingredient will give enough for an opossum skin, and proportionately more will be required for larger ones. When the skin has soaked in the warm water, lift it and spread it out flat, so that the paste may be applied with a brush to the inside of the skin; more paste will be required where the skin is thick than where it is thinner. Double the skin together, flesh side inwards, and place it in a cool place for twenty-four hours, at the end of which time it should be washed clean, and treated in the same way as before with a mixture of 1 oz. of sodium carbonate (washing soda), ½ oz. borax, and 2 oz. hard white soap; these must be melted slowly together without being allowed to boil. The skin should then be folded together again, and put in a warm place for twenty-four hours. After this, dissolve 4 oz. alum, 8 oz. salt, and 2 oz. sodium bicarbonate (baking soda) in sufficient hot water to saturate the skin; the water used should be soft, preferably rain water. When this is cool enough not to scald the hands. the skin should be immersed and left for twelve hours; then wring it out and hang it up to dry. The soaking and drying must be repeated two or three times, till the skin is soft and pliable, after which it may be rubbed with fine sand-paper and pumice-stone to obtain a smooth finish.

A second method, in which wattle-bark is the tanning agent, is not so quickly accomplished, but properly adopted it should give better results than the other. Collect some wattle-bark and make a strong decoction by boiling or steeping the bark in water. A bushel of crushed bark from a tannery, if one is near at hand, will be found an easy way of getting the best bark. The skin should be scraped clean on the inside, as in the "lightning process," before steeping begins. It is best to let the skins lie as flat as possible while soaking; and a large, square, zinc-lined packing-case is, therefore, preferable to a barrel. The skins should be thoroughly covered by the liquid, which must either be changed once a week, or boiled anew and skimmed. While the skin is out of the liquid each week it should be lightly scraped. Large skins take up to six weeks to tan well, but opossum skins will not require more than a month.

Fungus and other Diseases of Stone Fruits.

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E. MACKINNON, B.Sc., Assistant Biologist.

PEACH LEAF CURL.

The name Leaf Curl has been given to a fungus disease of the peach from the appearance of the affected leaves. The first formed leaves may become enlarged, thickened, puckered, and distorted, and soon fall off. Although the leaves and tender shoots are particularly affected, injury may also be caused to the flowers and fruit. The disease is due to a parasitic fungus known as *Exoascus deformans* (Berkley) Fuckel, and it attacks the peach, apricot, nectarine, and almond. It is one of the most widely-spread diseases, occurring in all countries where peaches are grown.

The destructive action of Leaf Curl is not so clearly seen as in the case of an attack of Brown Rot. The latter disease becomes quite obvious, as the fruit is involved, and in a few days an entire crop may be rotted; whereas Leaf Curl, unless severe enough to cause defoliation, may escape observation. This disease was very carefully investigated for a number of years in the United States by Newton B. Pierce, and his work on Peach Leaf Curl has been of great assistance in describing this disease.

Symptoms.

The signs of disease first show when the buds open in spring. Affected leaves, as they unfold, become curled and deformed, and the colour changes to a reddish hue; later they become pale and mealy, due to the surface becoming covered with the spores that are developed. If the entire leaf is affected, it may become greatly broadened and thickened, puckered or crumpled, and deformed (Fig. 1), the green colour changes to yellow, and the whole leaf has a sickly appearance. In the course of a few days the leaves fall off, and if defoliation is extensive, the newly-formed fruit becomes stunted in growth, or turns yellow, wilts and also falls off.

Shoots may also be attacked (Fig. 3). They become swollen and pale in colour, and in severe cases die back. There is often a great reduction in the length of the infected portion of the shoot and a shortening of the internodes, so that a tufted appearance is produced. When the terminal bud is not killed, it may continue to grow later in the season, thus leaving the injured or swollen portion at the base of the new growth. Gummy exudations sometimes appear on the enlarged twigs, particularly when the enlargement is not terminal. A new crop of leaves develops more or less rapidly, according to the severity of the attack and the conditions of air and soil prevailing at the time. If the soil and air be dry, and the temperature high, new foliage may appear slowly, and much of the terminal growth may die. The new crop of leaves usually remains comparatively free from curl for the rest of the season.

The Fungus

The cause of the disease is the fungus known as *Exoascus deformans* (Berkley) Fuckel. It has been known for over fifty years, having first been described by Berkley, while the disease was known for over thirty years before it was identified. The disease has been known in Australia over fifty years.

A comparison of cross sections of diseased and healthy leaves (Fig. 4) shows marked differences in the structure of the host tissues. In a normal healthy leaf in section, we see a thin cuticle and epidermis of a single row of cells, and underneath this several rows of somewhat upright oblong cells—the palisade cells. Next comes the spongy mesophyll tissue, consisting of cells more rounded but loosely connected together, leaving many air spaces between, which communicate with the air through apertures (stomata) in the epidermis. The palisade and mesophyll cells contain in the sap small bodies known as chloroplasts, which give the green colour to the leaves. In a diseased leaf, owing to some stimulus produced by the fungus, a great increase takes place in the number, shape, and size of the cells, as well as a change in their contents. The cells become irregular and increase in number, so that the leaf thickens. The chloroplasts disappear from the cell contents, and the colour changes to various reddish shades, and finally to yellowish tints. The mycelium of the fungus ramifies through the leaf tissue between the cells, finally pushing up between the epidermal cells and then between the epidermal cells and the thin cuticle overlying them. In the latter position, very many small cells are formed, which make almost a continuous layer beneath the cuticle (Fig. 5, section 2). From these cells prolongations are pushed out through the cuticle (Fig. 5, section 1); the contents of these develop into spores. These prolongations, which are somewhat oblong with truncated ends, are the asci, and at maturity they usually contain eight spores (Fig. 5, section 3). The ascospores, however, may increase greatly in number by budding, either within the ascus or after they are expelled from the upper end. These spores, covering the surface of the leaf, produce the whitish mealy appearance. The spores germinate by sending out a small tube (Fig. 5, sections 4, 5, and 6), which in all probability infects new leaves. The actual infection of a leaf has never yet been seen or proved, but certain facts suggest that infection takes place by means of the spores.

It was for long supposed that the fungus was largely propagated by perennial mycelium, or by infection taking place in the summer and persisting in the woody parts until the following season. But badly infected branches are apt to die and dry out, thus affording no living tissue for the support of the infesting mycelium, and a single spraying just before the buds open will prevent practically all the disease, while an application made after the tips of the leaves show will not control it. Such observations as these point to the fact that most of the spring infection of the peach leaf results from spores which have wintered on the tree and about the newly formed buds.

Infection is largely influenced by weather conditions. The disease becomes more prevalent after a cold, damp spell in the spring, if it occurs as the young

Fig. 1.—"Leaf Curl" of the Nectarine (*Exoascus deformans*).
[*From the Transvaal Agricultural Journal.*]

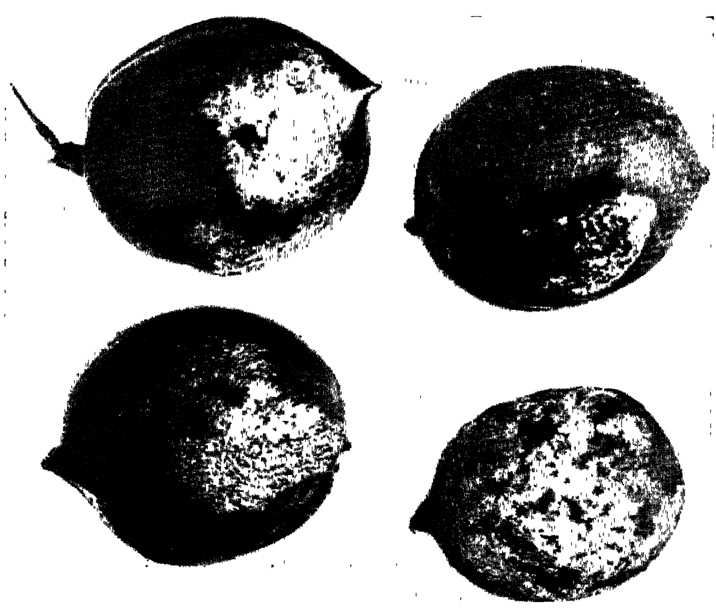


Fig. 2.—"Leaf Curl" Fungus on fruit, Nectarines.
[*From the Transvaal Agricultural Journal.*]

Fig. 3.—A comparison of Twigs.

a Healthy Twig
b and *c*. Twigs in which the Leaf Curl is wintering.
c Twig killed by the fungus.

[*From Cornell Bulletin No.* 276.]

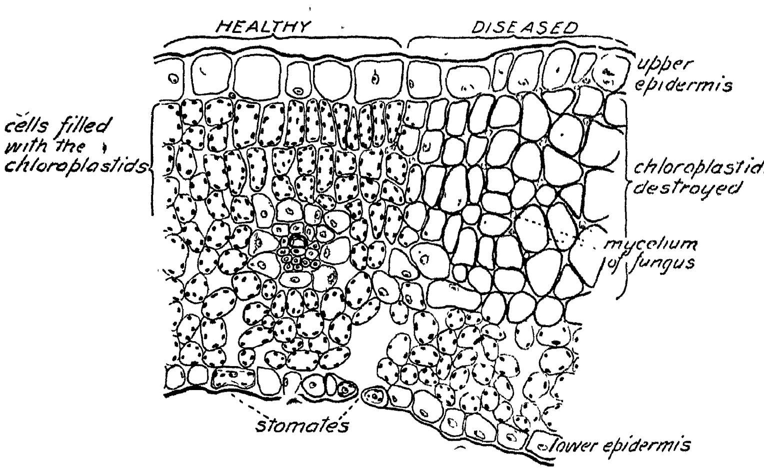


Fig. 4.—Cross section through a Peach Leaf along the line of diseased and healthy tissue.

Note the increase in size and number of the palisade cells in the diseased portion, and also the absence of chloroplasts.

buds begin to unfold. The disease is rarely serious in a uniformly dry, warm spring. Similarly, where infection has occurred, the development of the fungus in the tissues of the host may be checked by the return of warm, dry weather. Some varieties are affected more frequently and more severely than others, but changes in soil, situation, and other environmental conditions may alter the resistance of the variety. The variety of peach, Elberta, appears to be susceptible in all countries. Owing to the disease being effectively controlled by spraying, the growing of resistant varieties is not essential, especially as some of the most desirable varieties are somewhat susceptible to disease.

Prevention.

Experiments have proved that a thorough spraying with either Bordeaux Mixture or Lime-Sulphur will prevent the disease. *The proper time to spray is in the late winter or early spring, just before the buds open.* Bordeaux is the most effective spray, and full winter strength (6–4–22) can be used, as there is no foliage to injure.

BROWN ROT.

There is no doubt that Brown Rot is the most serious disease of stone fruit in this State, as it is in the rest of Australia and elsewhere. While every season there is more or less rot present, the season just closing, owing to the exceptional weather conditions, has been a very disastrous one for many orchardists. Peaches (Fig. 6), plums, nectarines (Fig. 7), and cherries (Fig. 8) have all been most severely attacked. In one orchard it is estimated that 1,200 cases of cherries were lost. Although the disease may occur on other fruit—such as apples, pears, strawberries, &c.—with us the disease is only serious with stone fruits. During the months of December, 1914, and January, 1915, there was a succession of hot humid days, with occasional showers and cloudy days. We had sufficient rain to induce a vigorous growth of wood, and also to cause the fruit to become more or less watery and tender. Under these favourable conditions the disease, present in all orchards, developed and spread rapidly. As the fruit begins to ripen it is most readily attacked, and whenever such conditions prevail—heat and moisture at or near the ripening period—serious loss from Brown Rot is more than likely to occur. It is thought by some that the rotting of the fruit is due to the rainy weather, but the disease is produced by a very active parasitic fungus, and no such rot would occur if the fungus were not present. Investigations in America show the close relationship between the loss due to the Brown Rot fungus and the weather conditions, *e.g.*, in Georgia in 1898, the peach crop was good, and was well marketed :—

Year.	Six Months' (March-August) Rainfall.	June Rainfall.	Variation from the Average.
1898	29·93 inches.	3·27 inches.	−1·43
1900	30·36 ,,	8·98 ,,	+4·58

Two years later, the June rainfall was nearly three times as much, and much above normal. Before the rain there was every promise of a fine crop, but after the rain fully 40 per cent. of the peaches were ruined by Brown Rot, representing a money loss of about £100,000.

The month of June in the United States corresponds with our December, when many of our local fruits are coming on the market. A similar case is recorded from Missouri:—

Month.	Average Rainfall for Twelve Years preceding 1910.	Year 1910.
June	4·14 inches.	9·01 inches.
July	4·77 „	12·29 „

In unsprayed orchards in Missouri, in the year 1910, owing to the great rainfall for June and July, the loss was almost 100 per cent.

In New South Wales the year 1913 was very dry, whilst the spring of 1914 in the county of Cumberland was wet. The figures following were supplied by the Weather Bureau, and are practically correct for our local stone fruit districts:—

Rainfall (in inches).

Month.	1913–14.	1914–15.	Variations from the Normal (above +; below −).	
			1913–14.	1914–15.
August...	0·11	2·13	−3·09	−1·06
September	1·47	5·22	−1·35	+2·36
October	1·14	7·53	−1·62	+4·69
November	0·80	2·56	−2·09	−0·30
December	0·22	7·15	−2·32	+4·52
January	0·66 (1914)	1·18 (1915)	−2·91	−2 30
Totals for six months...	4·40	25·77	−13·38	+7 82

Mean Temperature (degrees Fahrenheit).

Month.	1913–14.	1914–15.	Variations from the Normal (above +; below −).	
			1913 14.	1914–15.
August...	55·6	57·4	+0·7	+2·5
September	59·9	59·8	+0·9	+0·8
October	68·9	65·4	+2·4	+1·9
November	67·3	71·5	+0·3	+4·4
December	70·2	70·1	+0·1	=
January	73·1 (1914)	72·4 (1915)	+1·5	+0·8

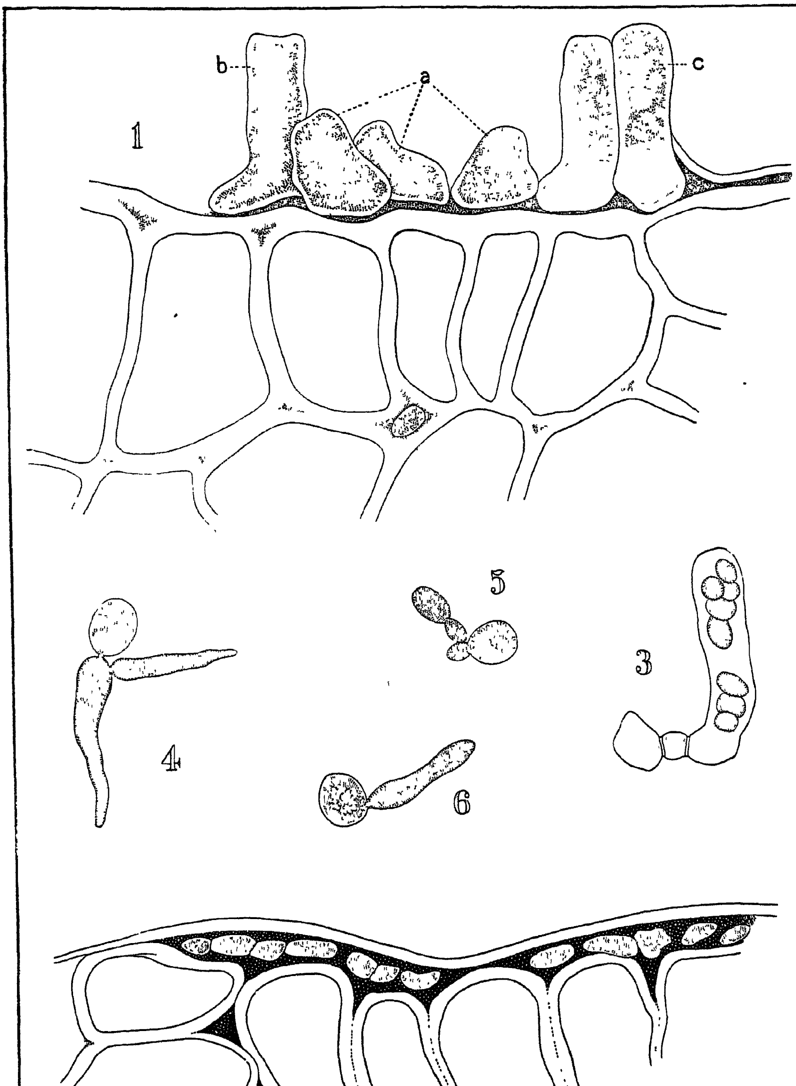


Fig. 5.—1. Section of Peach Leaf showing development of asci from cells formed beneath the cuticle.
2. Section of Peach Leaf showing mycelium beneath the epidermis and beneath the cuticle.
3. Ascus with eight ascospores.
4, 5, and 6. Ascospores germinating and budding.

[*After Pierce.*]

FUNGUS AND OTHER DISEASES OF STONE FRUITS.

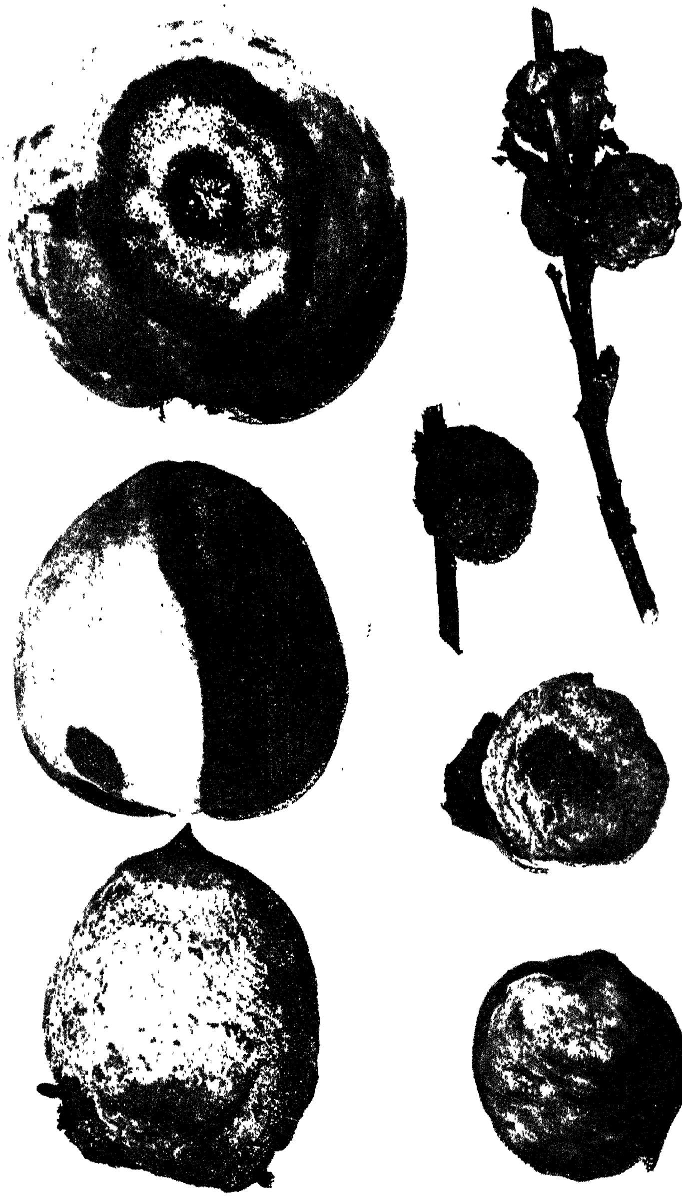


Fig. 6.—Brown Rot (*Monilia fructigena*).
Peaches and Nectarines showing progressive stages in the development of the disease.
The "mummified" nectarines are shown in the upper right-hand figures.

FUNGUS AND OTHER DISEASES OF STONE FRUITS.

It will be noticed that for the six months—August, 1913, to January, 1914—the total rainfall was over 13 inches below normal, whilst for the six months—August, 1914, to January, 1915—the total was nearly 8 inches above normal, making a difference between the two periods of 21 inches. The month of December, 1914, was 4·52 inches above normal, and in the spring there were also two wet months, September and October, 1914. The temperatures do not show any great variations from normal, except November, 1914, which was 4·4 degrees above normal. The month of December, 1914, was normal in temperature (70 degrees), while the rainfall, as shown above, was above normal, and hence was a very favourable period for the development of Brown Rot. Spring conditions were also favourable in 1914, so that the disease (Brown Rot) was very devastating, and growers have suffered heavy losses. During the previous season (1913) the loss was light compared with the last, chiefly owing to the rainfall being so low in 1913.

The Fungus.

The fungus causing the disease has been known to scientists for over 100 years, but it is only about thirty years since its economic importance was first recognised. It is now well known all over the world wherever peaches are grown, and has been closely studied in the United States, Germany, and Russia. It is only within the last twelve years that its full life-history has been discovered. In Europe the disease occurs on stone fruits, apples, and pears, but does not appear to be nearly so serious as it is in America on stone fruits. It is estimated that in the United States the average annual loss in the peach crop alone is £1,000,000. In the United States it is practically impossible to obtain a crop of high-grade European plums in seasons which are favourable to the spread of the fungus. The native American plums are relatively free from injurious attacks of the disease, and the Japanese plums do not suffer so severely as European varieties. Entire cherry crops are also sometimes lost. In New South Wales, in certain districts this season, the disease has been very serious in cherries, peaches, plums, and nectarines.

Brown Rot is characteristically a disease of the fruit, and the loss in this way is the best known and the most readily observed. The fruit is attacked not only while hanging on the tree, but during transportation, marketing, and retailing, thus all classes—growers, agents, retailers, and consumers suffer loss from the ravages of the fungus. Although the fruit may be carefully sorted before packing, and only apparently sound specimens packed, the disease may develop during carriage and marketing. In an orchard where the disease exists, sound fruit may be readily contaminated during handling, and the rot may develop more or less rapidly afterwards, according to the surrounding conditions. After infection under warm moist conditions, within twenty-four hours one-third to one-half of a peach may be rotten, and in forty-eight hours the whole fruit may be a soft rotten mass.

The appearance of the disease may vary in minute respects, depending on the fruit attacked. On a peach (Fig. 6) the first indication of infection is usually a small circular brown spot. Under favourable conditions this

rapidly enlarges, and soon whitish to greyish tufts begin to appear on the surface, at first sparingly, but in a day or so the infected area may become quite covered with the characteristic grey mould, and in a short time the peach is quite rotten, brownish, and more or less shrunken. Fruit attacked when on the tree may either fall to the ground or may shrivel up and remain hanging, forming the so-called "mummies" (Figs. 7 and 9). In plums the indications of infection may not be so evident, and the fruit may be infected with mycelium and show but slight (if any) signs that such is the case. Usually, as the first fruit ripens, the grey tufts appear on the surface. It thus happens that sometimes there is more loss in the case of plums after packing than with peaches, as the infected ones are more difficult to detect and sort out.

The fungus causing Brown Rot was first described by Persoon in 1796, who then named it *Torula fructigena.* Later he changed the name to *Monilia fructigena.* Many fungi have a complex life-history, with two or more stages, developing different structures according to the host, the season, or the surrounding conditions. The Brown Rot fungus has two such stages in its development, the one above mentioned, *Monilia fructigena* being the name given to the conidial stage or summer form, and the other, *Sclerotinia fructigena,* the name given to the "perfect" or "ascigerous" condition, developed in the early spring after winter rest periods. This name was given by Schröter in 1893. As such a fungus is named according to the higher or ascigerous form, the name of the Brown Rot fungus becomes *Sclerotinia fructigena* (Persoon) Schröter. The *Monilia* stage has been very well described by Quaintance, and the following description is mainly from his account (Georgia Bul. 50):—

Throughout the summer and growing season generally, the fungus (Fig. 10) is propagated by myriads of spores (conidia) formed on the ends of threads (hyphæ), which push their way to the surface of the fruit. These small bodies are developed in bead-like chains, which collectively make up the ash-grey tufts of "mould" seen on the surface of affected fruit. The spores are formed by constrictions only, or by successive fission at the ends of the hyphæ. In the formation of branches a cell broadens (Fig. 10B) at its distal end, thus forming two angles, from each of which a spore chain may develop. Owing to the indeterminate mode of development of a spore chain, its length is not limited, but usually, after the chain has grown to a greater or less length, the individual joints mature and the resulting spores may soon become more or less separated. Under the influence of warmth and moisture, these spores may germinate readily (Fig. 10c), and if lying on the surface of a peach or similar fruit, the germ tube grows through the skin down into the tissues, where there soon develops an extensive much-branched growth, forming collectively the mycelium. It is the action of this mycelium during the course of its growth that brings about the rotting of the fruit. The development of the fungus is quite rapid. Spores may germinate while still attached to the spore chain; no resting period seems to be required. The spores are mostly oval, colourless, and with granular contents. The vitality

Fig. 7.—Nectarines "mummied" on a branch by the Brown Rot Fungus.

FUNGUS AND OTHER DISEASES OF STONE FRUITS.

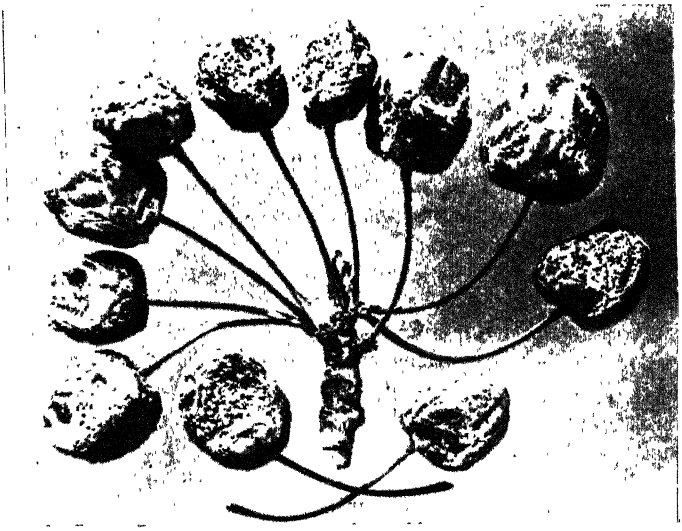


Fig. 8.—Brown Rot (*Monilia fructigena*) on Cherries.

FUNGUS AND OTHER DISEASES OF STONE FRUITS.

of the spores is of interest, and has a bearing on the method of treatment. Their vitality is greater than their structure would suggest. Spores from cherries which had hung on the trees for a year germinated readily in moist air, and when sown upon young leaves and flowers soon developed to such an extent as to produce the characteristic discolourations.

The mycelium traverses the infected parts in all directions, deriving its nourishment from the cells of the host, and bringing about the changes known as Brown Rot. It is the function of the mycelium to secure food for the growth of the fungus and for the development of spores, by which its reproduction is brought about. The mycelium as found in peaches and plums is thin-walled, septate, of varying diameter, and contains numerous vacuoles. In older hyphæ these vacuoles may disappear, and the contents become more or less granular. In the dried-up fruit hanging on the trees or lying on the ground, the mycelium assumes a dormant condition during the winter, and under suitable conditions in the spring develops an enormous number of ordinary summer spores. The hyphal threads may also be transformed into chains of more or less rounded highly granular cells, which in some cases become entirely separated from each other. These cells may represent a resting stage (gemmæ), and help the fungus to withstand the winter. They are very much like what are known as chlamydospores of many other fungi, *e.g.*, Fusarium, which are thick-walled bodies formed from the mycelium of the fungus, and usually containing coarsely granular contents. They enable the fungus to withstand conditions unfavourable to its active growth, such as want of sufficient moisture and warmth. On the return of favourable conditions the chlamydospore develops into an actively growing mycelium. It is by means of the hibernating mycelium in the dried-up fruit (mummies) lying on the ground, or especially in those hanging in the trees, that the spores are produced for the spring infection. The mummied fruit, when brought into the laboratory and placed in a warm, moist chamber, very soon produce numerous tufts bearing spores.

It may be here mentioned that there has been some confusion in Europe and America as to the exact species of *Monilia* causing Brown Rot. Woronin showed in 1899 that there are two closely allied species, *M. fructigena* and *M. cinerea*, that cause Brown Rot on various fruit. These had been both classed as *M. fructigena*. Much work has recently been done in the United States and also in Europe on these fungi, and evidence is greatly accumulating which shows—(1) that it is *M. cinerea* which causes Brown Rot of stone fruits in the United States, and that *M. fructigena* does not occur there; (2) that while *M. fructigena* is chiefly found on pomaceous fruits in Europe, it may also occur on stone fruits, and that *M. cinerea* is found only on stone fruits in Europe. This difference in species is of more importance than it appears to be at first sight, for it is apparently the cause of some of the irregularities obtained in the varying control experiments that have been recorded. It has been found by Ewert in Germany that the spores of the two species are differently affected by winter conditions. The conidia of *M. fructigena* lose their capacity for germination very early in the winter, and the fungus

persists solely by means of the mycelium. New spores are produced in the spring from the mycelium. The conidia of *M. cinerea* are capable of germinating at any time during the winter. They persist through the winter in the spore cushions on mummies of cherries, plums, and other stone fruits, and they may also exist on pome fruits. Exposures to very low temperatures do not injure the germination capacity of the spores. The mycelium also remains alive, and produces new spore cushions in the spring. The twig blight of stone fruits which flower early in the season is caused entirely by *M. cinerea,* whose spore cushions are produced much earlier than those of *M. fructigena*. The spores of *M. fructigena* are not formed at the flowering time of the stone fruits. In all probability the disease of our stone fruit is the same as the European one, having been introduced from there, and not from America. We have no records of the discovery of any naturally occurring apothecia in Australia, and much "pure culture" work will be necessary before the species can be determined with any satisfaction. For the present we shall retain the name *M. fructigena* until investigations here will have cleared the matter up.

In addition to the *Monilia* stage above described, another stage may be developed. From certain characteristic appearances noted on mummies kept under observations and also in artificial cultures of the fungus, it was suspected that an ascigerous stage existed. On this account the fungus was named *Sclerotinia fructigena* in 1893, but it was not until 1902 that Norton discovered this stage in the orchard. It is sometimes found that mummied fruits that have fallen to the ground and have remained for two springs, produce a number of brown saucer-shaped or cup-shaped bodies, each on a stalk (like a small mushroom). They are produced from small black hard or leathery bodies known as sclerotia, developed by the fungus in the mummy. These cup-shaped stalked structures, known as ascocarps or apothecia (Fig. 10D), vary in size, and may be as large as three-quarters of an inch in diameter. A cross section of one of these cups, examined under the microscope, shows a layer of cylindrical sacs, each containing, when mature, eight oval spores (Fig. 10E). These are the ascospores enclosed in the asci. Interspersed with the asci are many upright threads. When the mature ascocarps are disturbed, the spores are distributed in a miniature cloud. They are capable of immediate germination, just like the *Monilia* spores, if the moisture conditions and temperature are favourable. Thus a new spring infection can be produced. The ascocarps are produced only during the blooming period, and the spores may infect the blossoms. Shortly after the petals fall, no more ascocarps can be found. As a period of about twenty months elapses before the ascocarps are formed on mummied peaches and plums, this may account for their being found but rarely. They are most likely to be found on mummied fruit partially covered by dead leaves and grass. This stage was very plentiful in the western parts of the United States in 1906, and again in 1910. We have no records of its discovery in New South Wales, nor are we aware of its occurrence in Australia. This stage is not necessary for the fungus to carry on its existence, as the hibernating mycelium, or even the spores, are the usual starting points for the new

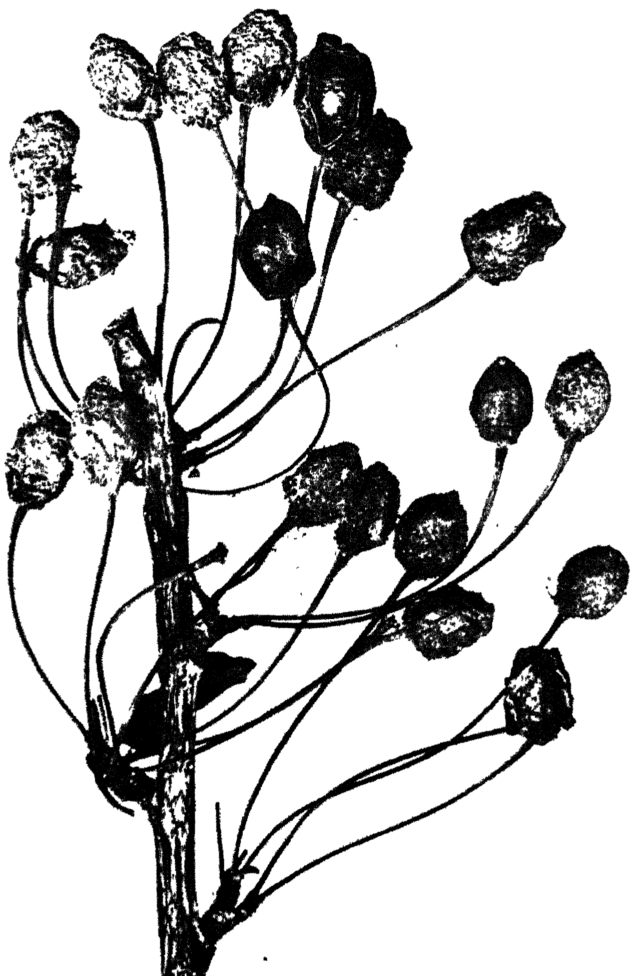
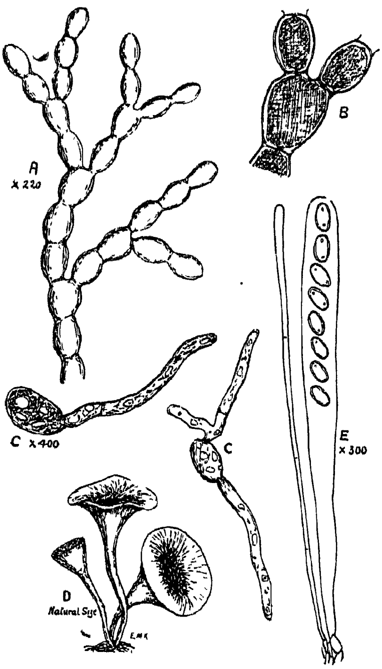


Fig. 9.—Cherries "mummied" on a branch by the Brown Rot Fungus.

FUNGUS AND OTHER DISEASES OF STONE FRUITS.



A—Monilia stage, showing chains of conidia.

B—Broad cell where branching occurs. (The dark shaded masses represent the protoplasm.)

C—Conidia germinating.

D—A group of apothecia (or ascocarps) which develop from mummied fruit.

E—An ascus containing eight ascospores. With the ascus is a paraphysis.

Fig. 10.—The Life History of the Brown Rot Fungus.

Fig. 11.—Cankers produced on Peach Limbs by the Brown Rot Fungus.

[*From Phytopathology.*]

spring infections. From infected blossoms, the *Monilia* stage will be produced and young developing fruit become infected.

The spores of the fungus are distributed for the most part by air currents. In addition, they may be washed by rain from diseased to healthy fruit, and also distributed by insects. While the germ tube can penetrate the uninjured surface of fruit, punctures, bruises, and other injuries are especially favourable for its entrance. Two or more fruits touching one another also aid in extending the disease.

Besides the extensive damage done to the fruit, the fungus may seriously injure flowers and twigs, and cankers may be produced on the branches (Fig. 11). R. A. Jehle has quite recently investigated, in New York State, the attack on blossoms and twigs and the production of cankers on peach trees, and the following information is given from his work (Phytopathology, 3/106):—

The fungus enters the limbs of peach trees in two distinct ways, namely, through the diseased blossoms and through the diseased fruit. In the spring of 1911 and 1912 in New York, blossom infection was very prevalent. It was especially abundant in orchards where apothecia had been produced in large numbers. Infection seemed to begin at the calyx or the corolla (petals), and spread from there into the stamens and pistil, accompanied by a withering and browning of the diseased portion. Sometimes only the petals become diseased, and these are then shed without further injury to the pistil, but usually the entire flower becomes infected, and the disease travels down the pedicel of the peach-flower, finally entering the fruit spur, causing there the exudation of a large quantity of gum, which surrounds the blossoms and seals them fast to the spur. Such diseased blossoms remain clinging to the fruit spurs during the entire summer, and whenever there is sufficient moisture the typical ash-gray tufts of conidia are produced in great abundance on the infected floral parts or fruit spur, and are a source of infection for healthy fruit. When the fruit spurs are borne on large limbs, the fungus may travel down the spur into the large limb, where it spreads out and produces a canker. When the spur is produced on a small limb, that limb is killed outright, and twig blight is produced. The fungus may continue this killing process until a large limb is finally reached, and then may spread out and form a canker. Sometimes the fungus may travel slowly, and only a small area surrounding the fruit spur becomes infected. The disease has also been traced from the diseased fruit through the fruit spur into the limb. Sometimes cankers were produced.

Control of the Fungus.

For many years no successful method of controlling Brown Rot was known. The disease spreads so rapidly that in a few days an entire crop may be destroyed. In seasons which are favourable for the fungus perfect control can hardly be obtained, although the loss can be reduced to a small percentage. Another difficulty with peach and plum is the tender nature of their foliage, especially at the times when spraying is most valuable. These leaves are

very sensitive to poisons in general, and to copper compounds in particular. (Brain, Tennessee Bul. xv. 2.) They have the power, which may or may or may not be possessed by the leaves of other plants, of dissolving copper hydroxide. They have a cuticle which is somewhat thin and permeable, compared with many other leaves, and they are especially sensitive to the various agencies producing leaf fall. On account of these characteristics, it has proved very difficult to use Bordeaux Mixture as a summer spray for peaches and plums. This is especially the case if misty weather prevails. It has been found, however, that lime-sulphur can be successfully used to control Brown Rot, and also scab (*Cladosporium carpophilum*). Some orchardists expect to control most insect and fungus troubles with one or two sprayings, and sometimes these are delayed until signs of disease appear. For several diseases—*e.g.*, Leaf Curl, Brown Rot, and Rust—an early spraying, just before the buds open, is recommended. As there is no foliage on the tree at this time, it is most satisfactory to spray with Bordeaux winter strength (6-4-22), and use lime-sulphur for subsequent sprayings. In all cases it is necessary that the sprayings be well done to make them effective. We have seen some cases where the spraying must have been very irregular, as many parts of the foliage and fruit have had no signs of any deposit from the spray. Three sprayings at least should be given, the first with Bordeaux, as above indicated, before the buds open; the second with lime-sulphur, three or four weeks after the petals have fallen; and the third with lime-sulphur, about a month before the fruit ripens. This is the minimum number of sprayings that can be given with any hope of success in controlling this disease. Possibly further sprayings will be necessary, the deciding factor being the prevailing weather conditions. In addition to the sprayings, all mummies should be knocked from the trees after the leaves fall in the autumn, and, along with those already on the ground, be gathered and destroyed by burning.

Owing to the abundance of Brown Rot during the past season, we would especially urge all orchardists to thoroughly attend to the cleaning up of their orchards and trees before next spring, pruning out all dead wood, removing all mummies, and thoroughly spraying with strong Bordeaux before buds burst. Unless this is well done there is bound to be an abundance of spores for infection next season. Judicious thinning of the fruit, to prevent two or more fruit hanging together, is also recommended. If it is desired to also spray with arsenate of lead for the control of leaf-eating insects, at the same time as spraying for fungi, 1½ lb. of lead arsenate can be added to 50 gallons of the spraying solution.

(*To be continued.*)

Pure Berkshire Boars and Sows for Sale.

Insectivorous Birds of New South Wales.

[Continued from page 520.]

WALTER W. FROGGATT, F.L.S., Government Entomologist.

No. 55. The Lyre Bird (*Menura superba*).

THERE are three distinct species of Lyre Birds inhabiting the coastal forests of eastern Australia, the Victorian Lyre Bird in Gippsland, the above species peculiar to New South Wales, and the Albert Lyre Bird restricted to the northern river scrubs of New South Wales and southern Queensland, and ranging only as far north as Wide Bay. It is somewhat remarkable that these birds are not represented in the rich tropical forests in the north. No bird attracted more attention than our Lyre Bird when first brought under the notice of naturalists.

On account of its wonderful tail it was first classed among the Birds of Paradise, then because of its size and powerful scratching feet it was considered to be a gallinaceous bird; finally, from the study of its anatomy, it was shown to be a perching bird allied to the thrushes. The three species are now placed in the family *Menuridæ*.

The original native name of the Lyre Bird was "Buln Buln," on account of its usual call note. The early settlers called it in different localities the "Mountain Pheasant," the "Native Wood Pheasant," or simply the "Pheasant," because of its colouration; in other places it was known as the "Mocking Bird" in reference to its capacity for mimicking all the voices of the bush, but its present, and most characteristic popular name is the "Lyre Bird," in allusion to its wonderful tail, which is shaped like a Greek lyre. Many curious pictures were drawn, and accounts written about the Lyre Birds by travellers in the early days. One said that the male used to stand with its outspread tail turned to the morning breeze and create sweet music by allowing the wind to blow through the stiff feathers, like an Æolian harp.

Margaret Catchpole says: "The most beautiful attitude that I once saw the male Lyre Bird in, beats anything I ever beheld of what men call politeness. I have heard and read of delicate attentions paid to our sex by men of noble and generous dispositions, but I scarcely ever heard of such delicate attention as I one day witnessed in this noble bird towards its mate.

"I saw her sitting in the heat of the meridian sun upon her nest, and the cock bird sitting near her, with his tail expanded like a bower overshadowing her; and as the sun moved, so did he turn his elegant parasol to guard her from its rays. Now and then he turned his bright eye to see if she were

comfortable; and she answered his inquiry with a gentle note and rustle of her feathers."

Baron Cuvier, writing in 1859, says: "They are said to sing for a couple of hours in the morning, beginning when they quit the valleys till they attain the summit of a hill, where they scrape together a small hillock, as they exhume the grubs on which they feed; on this they afterwards stand, with the tail spread over them, and in this situation imitate the notes of every bird within hearing, till after a while they return to the low ground."

John Gould studied the Lyre Birds and gave us the first reliable account of their habits in his great work on the "Birds of Australia," published in 1848, and afterwards in several papers sent to the Zoological Society of London.

Though differing in plumage and colouration the three species appear to have identical habits, and all destroy large numbers of more or less destructive grubs, snails, and other forest pests. The life-history of *Menura superba*, the most handsome of the three forms, applies equally to the other two.

It is the size of a small fowl; the upper surface is of a uniform dull brownish black colour, and the under surface is lighter and silvery under the tail. It is this unique tail, that has been the cause of its undoing. In the earliest days of settlement, "the blackfellows prized it for an ornament, as well as the Europeans, who gave a great price for it." (Russell, 1839.) In 1861, Wheelwright speaking of the Dandenóng and Plenty Ranges in Victoria, says: "The blacks make periodical excursions up into the ranges about September, when the birds are full feathered, and come back laden with tails."

As regards the destruction of Lyre Birds for their tails, the writer remembers seeing them sold in the streets of Sydney, about 1888, for half a crown a pair, but Mr. Aflalo's story ("A Sketch of the Natural History of Australia," 1896) of two brothers in Sydney employing a number of men to shoot these birds, and obtaining 500 dozen tails in a few weeks seems to be somewhat exaggerated.

The Lyre Bird is a very active creature, and in spite of its size is seldom seen, though often heard, by the wanderer who invades its haunts. When suddenly startled it has the curious habit of jumping upward into the branches of a tree and there stopping. The tail-hunters learnt this habit, and with trained dogs soon "treed" the bird and shot it before it reached the top. The nest is a large affair constructed at the base of a tree, often hidden among the tree ferns, and containing a single dark-brown blotched egg. The nestling is a ball of brown fluff "all claws and beak," as a surveyor friend of the writer's described a half-fledged one that he tumbled across; it had rolled out of its nest among the ferns, and fought like a cat when he tried to pick it up.

It is interesting to note that the Mocking Birds of North America are Thrushes, and our Lyre Birds are allied to the same family. They are well

About one-sixth natural size.

INSECTIVOROUS BIRDS OF NEW SOUTH WALES.

"LYRE BIRD."

Menura superba.

About one-third natural size.

INSECTIVOROUS BIRDS OF NEW SOUTH WALES.

"NANKEEN KESTREL."

Cerchneis (Tinnunculus) cencroides.

known for their powers, not only of imitating other birds in the bush, but also of copying such sounds as the sharpening of a saw, the chopping of an axe, or the bark of a dog.

With well enforced protection against tail-hunters, there is no doubt that the Lyre Birds would soon increase and multiply in their forest surroundings but for the fact that the fox has entered into their domain, and this deadly enemy of all ground nesting birds finds the nesting Lyre Bird and the baby nestling easy prey. If, however, the Lyre Bird learns from this new experience to build her nest in the fork of a tree well off the ground, as some observers say she is doing, she may still hold her own in the scrub and fern tree gullies. A movement has been on foot to capture a number of Lyre Birds and turn them out in the fern-tree gullies on the slopes of Mount Wellington, in Tasmania, where there are no foxes, in order to save the species extinction and add to the charm of the Tasmanian bush.

No. 56. The Nankeen Kestrel (*Cerchneis cenchroides*).

This is one of the smallest of our hawks, and before settlement destroyed the hunting grounds of our birds of prey, it was a very common sight to see several hovering over the plain, their wings moving so rapidly that they appeared to be almost stationary.

The farmer is very prone to regard all hawks as enemies of the fowl yard, and under this impression has shot many of this species, but the writer has never known this hawk to meddle with chickens, though the Sparrow Hawk, which is about the same size, often makes a raid on the poultry-yard and carries off a young chicken. The food of the Nankeen Kestrel is chiefly small grass lizards, young snakes, and grasshoppers when swarming on the plains. Many years ago, when riding across the Terrick Plains in northern Victoria, I saw a pair of Nankeen Kestrels hovering in the air in their characteristic attitude with a long streamer hanging from the claws of one of the birds; while watching them, the object dropped from the hawk, and riding up I found lying on the grass a young brown snake, over eighteen inches in length, battered and dead.

This hawk, though it often occupies the deserted nests of crows and magpies, also often lays its four or five rather rounded, reddish-brown eggs, blotched with darker brown, in the hollow spout of the overhanging branch of a gum tree. The writer once had such a nest under observation on the Murray Swamps from the time the eggs were laid until he carried off the almost fledged nestlings. The tree was low, and the projecting branch broad where the end had broken off, so that the end was like a stove-pipe with plenty of decayed wood on the floor, and among this the eggs were laid. It was possible to lie along this limb and to look into the hollow, and even to handle the bright-eyed savage little Kestrels, who would strike out with their talons when very, very small. As the nesting place was on the daily route, many visits were paid during the upbringing of the family, and nearly always the floor of the nest contained portions of grass snakes, slow worms, or lizards; once or twice the feathers of a nestling Magpie Lark suggested

that the food supplies had not run short. In captivity the nestlings ate meat quite naturally, and when placed in an aviary, where in the adjoining compartment were some doves, one of them tried to seize the doves' wings when they came too close to the partition.

At the present time the Nankeen Kestrel is appearing again on the open timbered plains, and in the New England district during a day's ride one may often notice half a dozen or more of these graceful birds flying round or resting upon a dead branch, the white, grey, brown, black, and cinnamon tints being harmoniously blended into the Nankeen tints that give this little hawk its popular and appropriate name. As this bird, unlike many of our birds of prey, always kills its own food, and does not touch carrion, it has not suffered from the deadly poison cart and dingo baits.

As evidence of its value as an insectivorous bird, it may be mentioned that Lucas and Le Souef, in "Birds of Australia," state that the food consists of lizards and insects, while Campbell states that "the Nankeen Kestrel is almost insectivorous in diet, and has another prominent virtue, in that it kills small snakes."

Sawdust as a Mulch.

In connection with the note on the use of sawdust as a fertiliser, or a mulch for fruit trees, in the December issue of the *Agricultural Gazette*, a Gilgandra correspondent furnishes the following account of his experience:—

Re note on "Sawdust as a Mulch," my experience points to the fact that the use of sawdust is not to be recommended, at least, cypress pine sawdust.

Some two years ago, I gave a plot of ground a fairly heavy dressing (about 3 or 4 inches deep) of cypress pine sawdust, and while this treatment did not apparently adversely affect root crops, such as carrots, &c., it was absolutely fatal to legumes, such as garden peas, beans, and sweet peas. The few plants that did grow were stunted.

I also experimented with a portion of the sawmill dump, consisting of soil and decaying bark. The whole was a fibrous material, very much like "Jadoo fibre" in appearance, but it apparently prevented the proper growth of plants on which it was used, in the proportion of about one-fourth to one-half ordinary soil and one-fourth light sandy loam.

Possibly other kinds of sawdust might not be so deleterious, as I am of the opinion that, as far as legumes are concerned, the properties of the cypress pine, which render it practically immune to white ants (a phenyle, I believe), prevented the development of soil bacteria, as the few leguminous plants which struggled on, had none of the usual nodules on the roots.

The plot has now, two years since the treatment, apparently recovered, as I have this season raised good crops of French beans and sweet peas, though the sawdust has not decomposed to any extent.—E. G. Colquhoun.

A Descriptive Catalogue of the Scale Insects ("Coccidae") of Australia.

[Continued from page 511.]

WALTER W. FROGGATT, F.L.S., Government Entomologist.

Genus XXII. *Lecanium*, Burmeister.

Handbook of Entomology, vol. ii, p. 69. 1853.
Signoret, *Ann. Soc. Ent. France*, vol. iii (5), p. 396. 1873.
Fernald, *Canadian Entomologist*, vol. 34, p. 177. 1902.
Newstead, *Monog. British Coccidæ*, vol. ii, p. 75. 1903.

THIS cosmopolitan genus is well represented in Australia by a number of indigenous as well as many foreign species that have been accidentally introduced with their food-plants.

The adult females are naked, in a few species slightly floury or thinly covered with a fine varnish; very variable in form, from almost flat to oval, convex, and almost hemispherical, but becoming quite hollow beneath after egg-laying; retaining legs and antennæ; skin covered with simple glands, reticulations, or many-sided cells. Propagating without any ovisac, the whole body, as it shrivels up from beneath, forms a stout shell, protecting the eggs or living larvæ, after the death of the mother. So that in the adult female *Lecanium*, the characteristics of the coccid, in the earlier stages of her development, though still retained, are difficult to examine.

In the *Canadian Entomologist* (vol. 33, p. 57, 1901), Messrs. Cockerell and Parrott published a paper dealing with this genus, ("Table to separate the genera and subgenera of *Coccidæ* related to *Lecanium*,") in which they have subdivided the original genus out of existence. Mrs. Fernald, who doubts the validity of the genus *Lecanium*, follows their nomenclature in her catalogue, and the name of *Lecanium* is eliminated from the list of genera, and the *supposed type* is placed in the genus *Coccus*.

I have, however, retained this genus in dealing with our species, and, from an economic point of view, think it a very great pity that such a doubtful question of nomenclature should have been proposed, and followed by many writers in the United States. I endorse Mr. Newstead's remarks when he says: "Seeing that I have already referred to the genus as a whole under the old name of *Lecanium*, it would, I think, be extremely unwise to adopt any of the sub-divisions in this work, especially as many of the characters are extremely trivial and inadequate, and would tend rather to embarrass the student than otherwise."

Lecanium anthurii, Boisduval.

Chermes anthurii, *Ent. Hort.*, p. 328. 1867.
Sign. *Ann. Soc. Ent. France* (4), vol. viii, p. 843. 1868.
Sign. (Ser. 5), vol. iii, p. 435. 1873.
Maskell, *Trans. N. Zealand Institute*, vol. xxv, p. 219. 1892.

This species, originally described from Europe upon hothouse plants, and recorded from America, has been identified by Maskell from specimens from Victoria infesting asparagus.

General colour of adult female, brownish yellow, convex, rounded, but more flattened than *L. hemisphericum*: length, 2½ mm. Derm, with a pattern of oval marks, not conjoined, with a median clear space in the centre of each.

983. *Saissetia anthurii.* Cat. Coccidæ. p. 200.

Lecanium berberidis, Schrank. (Plate XIII, fig. 1, and Plate XIV, fig. 1.)

Coccus berberidis, Fauna Boica, vol. ii, pt. 1, p. 146. 1801.
Sign. *Ann. Soc. Ent. France* (5), vol. iii, p. 414. 1873.
Maskell, *Trans. N. Zealand Institute*, vol. xxix, p. 311, 1897, and vol. xxx, p. 237.

This is our largest dull-brown *Lecanium*, common on the grape vines, originally described from France. It was discovered in Victoria on vines, and doubtfully identified by Maskell in 1897 as this introduced scale, and he confirmed his determination in the following year. Until the last few years it was unknown in New South Wales, but at the present time it is very common in the vicinity of Sydney, and is spreading in our vineyards.

Adult female, reddish brown, slightly mottled with a darker tint, elongate, broad in proportion, very convex, slightly rugose on the back, with a short keel behind the anal cleft. The form is, however, very irregular when massed together; encircling the vine cane, they are much shorter and more rounded, and the margins are more impressed than in an isolated specimen. Length, ¼ inch, width up to ⅕ of an inch.

Treated with oil, the derm appears to be mottled reddish brown and yellow, central portion shield-shaped, irregularly marbled, encircled with a dark ring, with the outer edge yellow.

Newstead, in his description of *Lecanium persicæ*, says: "With regard to *L. berberidis*, *L. rugosum*, and *L. westeriæ*, I have little doubt in my own mind that they are also referable to *L. persicæ*." If Maskell's determinations of the two species are correct, his *L. persicæ* and *L. berberidis* are certainly distinct species.

914. *Eulecanium berberidis.* Cat. Coccidæ, p. 182.

Lecanium cappari, n.sp.

A western scale, common on the foliage of the "Wild Orange Bush" (*Capparis mitchelli*), wherever this prickly shrub occurs in the western scrubs of New South Wales. The adult female is a dark chocolate brown, with the edges lighter coloured; broadly rounded, convex, with the margins narrow, but finely crimped along the edge, and a short transverse carina on either side. Often variable in form, with the anterior portion constricted, so that the

posterior portion is more broadly rounded and depressed below the anal orifice. The dorsal surface is opaque and covered with a fine waxy secretion. Length, $\frac{1}{6}$ of an inch.

Treated with oil, the whole of the central area is an elongate oval shield with egg-shaped structures pointing outward, again encircled with a band of fine tesselated markings and the margin perfectly clear.

In the immature females the colouration is much lighter, with the margin yellow, and the form more elongate oval, with a slight dorsal carina. Male tests white, semi-transparent, elongate oval, flattened, with a white line on either side, converging to a point at the posterior angle. Lateral plates finely crenulated on the margins. Length, $\frac{1}{16}$ of an inch.

Lecanium casuarinæ, Maskell.

Trans. N. Zealand Institute, vol. xxx, p. 240, pl. xxvi, figs. 9–14. 1898.

This curious species was collected in the deserted chambers of some Hepalid moth larvæ in the stem of a Sheoak (*Casuarina*, sp.), at Myrniong, Victoria. I have a series of specimens of a closely allied if not the same species, found in a cavity under the dead bark of an injured Native Cypress (*Frenella robusta*).

Adult female, semi-globular, deep shining red, with the thickened margin black. Dorsum sometimes smooth, in others with one longitudinal and two transverse carinæ. Diameter, $\frac{3}{8}$ of an inch. Under surface convex, forming a regular box, no feet or antennæ; but when treated with potash, rostrum spiracles and abdominal lobes visible.

1022. *Lecanium casuarinæ.* Cat. Coccidæ. p. 211.

Lecanium depressum, Targioni-Tozzetti.

Studié Sul. Coccid., p. 29, 1867; *Cat. Coccidæ*, p. 37. 1869.
Signoret, *Ann. Soc. Ent. France* (5), vol. iii, p. 439. 1873.
Douglas, *Ent. Mont. Mag.*, vol. xxiv. p. 27. 1887.
Maskell, *Trans. N. Zealand Institute*, vol. xxv, p. 220. 1892.

An introduced European species, chiefly confined to hothouse plants, where it has been recorded in New Zealand, and discovered infesting vines and a Needlebush (*Hakea*, sp.) in New South Wales. It is also recorded from the West Indies, Brazil, and the Hawaiian Islands.

The adult female is reddish brown to black in colour; elliptical, more or less convex in form; length varying from $\frac{1}{8}$ to $\frac{1}{4}$ of an inch. Antennæ eight-jointed, feet rather long. Derm marked with small irregular cells, closely conjoined, forming a regular pattern, with a clear spot in the centre of each cell. Immature females light brown, more flattened, and often showing longitudinal ridges.

Maskell, in a paper in the *Entomologist* (1894), "Remarks on Certain Genera of Coccidæ," considers that *Lecanium begoniæ*, *L. nigrum*, and this species are probably identical. If this is the case, priority of nomenclature would make this a synonym of *Lecanium nigrum*.

987. *Saissetia depressa* Cat. Coccidæ, p. 201.

Lecanium expansum, Green. (Plate XIII, fig. 2.)

Indian Museum Notes, vol. iv, p. 9. 1906.
Coccidæ of Ceylon, pt. ii, p. 235, 1904, pl. 86.
Paralecanium expansum, Cockerell and Parrott, *The Industrialist*, p. 207. 1899.

The type specimens were described by Green upon the foliage of *Dalbergia* and *Litsea* from Ceylon. I obtained it upon the leaves of the Moreton Bay Fig (*Ficus macrophylla*), in the public gardens at Maryborough, Queensland, the greater part of the surface of the leaves being thickly coated with black smut, caused through the presence of these coccids.

Adult female pale yellow, with a greenish tint, when alive upon the foliage, marked with reddish brown. General form, irregularly rounded, very much flattened, thin, with the dorsal surface under the lens showing a delicate, silver-tinted shagreened sheen; the cephalic portion furrowed with two deep, widely separated, short, transverse lines; the anal cleft long and well defined. The immature females very thin, semi-transparent pale yellow.

976. *Paralecanium expansum.* Cat. Coccidæ, p. 199.

Lecanium filicum, Boisduval. (Plate XIII, Fig. 3.)

Chermes filicum, Ent. Hort., p. 335. 1867.
Packard, *17th Report Mass. Bd. Agri.*, p. 260. 1869-70.
Douglas, *Ent. Month. Mag.*, vol. xxiv, p. 28. 1887.
Maskell, *Trans. N. Zealand Institute*, vol. xxv, p. 220. 1892.

This is the common fern scale, originally described from Europe, but now found in many parts of the world, having been introduced with cultivated ferns in hothouses. It is common in the Botanic Gardens of Sydney upon ferns.

Adult female dull reddish brown; treated with oil of cloves, it becomes rich golden yellow, with a few deeper yellow-coloured blotches in the centre, and a dark band encircling the whole of the back, with a lighter coloured margin. The whole derm is tessellated with small, irregularly separated spots.

General form that of *Lecanum oleæ*, but smooth and more rounded, without the keel or ridges, and of a lighter brown tint when on the food-plant Douglas says: "Female scale, short, broad-oval, very convex, smooth, with two anterior and two posterior, slight blunt carinæ going rather obliquely from the back to the margin, thus interrupting the curve of the contour, and sometimes two or three short and sharp vertical carinæ at the sides joining the margin, which is broad and flat. Antennæ, eight-jointed, third longest; articulation of tibiæ and tarsi very distinct."

Allied to *Lecanium hemisphæricum*, having a flattened margin, but distinguished by the carinæ. Green considers it a smaller and more angular form of *L. hemisphæricum*, usually found on ferns.

990. *Saisselia filicum.* Cat. Coccidæ, p. 201.

Lecanium frenchi, Maskell. (Plate XIII, fig. 4.)

Trans. N. Zealand Institute, vol. xxiii, p. 17, pl. iv, figs 1–8. 1890.
Paralecanium frenchi, Cockerell and Parrott, *The Industrialist*, p. 227. 1899.

The type specimens were found upon a honeysuckle (*Banksia australis*), growing near Melbourne, Victoria.

This is a very handsome, elongate, oval, broadly-rounded scale, slightly convex; general colour, dark brown. The central part of the back is beautifully tessellated, with the outer margin finely ribbed or ridged on the margin along the sides, more irregular at the extremities. Diameter, $\frac{1}{8}$ inch. These details are brought out very clearly when treated with oil of cloves.

Maskell says: "The rich black colour and the curious fringe of small fans on the margin very clearly distinguish this insect. It would belong properly to Dr. Signoret's first series of the genus *Lecanium* (*Essai*, p. 226), though exceptional in its oviparous habit, and nearest possibly to *L. tessellatum*. But no species hitherto reported (as far as I know) exhibits a similar fringe."

Fuller described (*Trans. Ent. Soc. London*, p. 15, 1899) a variety of this species under the name of *L. frenchi*, var. *macrozamiæ*, from West Australia, upon *Macrozamia frazeri*.

Lecanium hemisphæricum, Targioni-Tozzetti. (Plate XIII, fig. 5.)

Studii sule Coccinglie, pp. 26. 39, 63; p. 63, 1867; *Cat. Coccidæ*, p. 38. 1869.
Lecanium coffeæ, Signoret, *Ann. Soc. Ent. France* (5), vol. iii, p. 435. 1873.
Comstock, *U.S. Dep. Agr. Report*, 1880, p. 344.
Newstead, *Monog. Brit. Coccidæ*, vol. ii, p. 114. 1903.

A cosmopolitan introduced scale, originally described from Europe, and recorded from New Zealand upon Camellia in 1884, and from Australia ten years later upon hothouse plants in South Australia. It probably has a wide distribution, as I have recently had specimens from Darwin (Northern Territory), from Mr. G. F. Hill, upon an undetermined weed. In Europe it is found on many garden shrubs (Oleander, Camellia, &c.), fruit trees (orange and peach), forest trees (sago palms, coconut palm, coffee, &c.).

The adult female varies in colour from light brown, reddish to almost black; more or less hemispherical in form, ovate or slightly elongate, convex, apparently smooth, but when examined with a lens seen to be thickly studded with yellowish dots. In the immature females the dorsal surface shows parallel and transverse carinæ, which form a distinct H on the back, but this is very indistinct on the adult forms. Length, $\frac{1}{8}$ of an inch. Height, $\frac{1}{12}$ of an inch. Several closely allied forms have been described as distinct species, such as *Lecanium hibernaculatum* and *L. clypeatum*, which are not considered synonyms of *L. hemisphæricum*.

993. *Saissetia hemisphærica*. Cat. Coccidæ, p. 202.

Lecanium hesperidum, Linnæus.

Coccus hesperidum, *Syst. Nat.*, edition x, vol. 1, p. 455. 1758.
Burmeister, *Handb. Entomology*, vol. II, p. 69. 1835.
Maskell, *Coccidæ of N. Zealand*, p. 80. 1887.
Newstead, *Monog. Brit. Coccidæ*, vol. ii, p. 78. 1903.

One of the first described, and most widely distributed species, commonly known as the "Soft Scale" of the orange, but found upon many cultivated plants and even native shrubs.

Female coccids when immature are greenish yellow, soft and flattened, only slightly convex, and often half curled round the young branchlets, or flattened down on either side of the mid-rib of the leaves.

Adult female dull orange to yellowish brown, with darker markings and spots all over the central portion of the derm. Length, $\frac{1}{8}$ of an inch. In the adult form, swollen and rounded in the centre, elongate, narrowed behind, often with one side of the cephalic portion curved to one side.

A great deal has been written about this species. There is a list of 83 references to it in Mrs. Fernald's catalogue. Douglas (*Entomologists' Monthly Magazine*, 1887) describes the male coccid. Maskell and Douglas have written regarding the affinities of *Lecanium hesperidum* and *L. lauri*, but the latter is now considered only a variety of the former. Another variety, *L. hesperidum* var. *pacificum*, has been described from the Galapagos Islands.

843. *Coccus hesperidum*. Cat. Coccidæ, p. 168.

Lecanium levis, Maskell.

Trans. N. Zealand Institute, vol. xxviii, p. 392. 1896.
Akermes levis, Cockerell, *Ann. and Mag. Nat. Hist.* vol. ix, p. 453. 1902.

Found upon the branchlets of *Acacia longifolia* and several other species of wattles, in the neighbourhood of Sydney, New South Wales. Allied to *Lecanium scrobiculatum*.

The adult female is convex, also flanged on sides and front; dorsum convex, rounded, rising up from the outward flange. Bright, shining, usually dull yellow to brownish, clouded with dull red patches, with many small pits, but without any circular tubercules. Length, $\frac{1}{12}$ inch.

Cleared in oil, specimens are dark reddish-brown, finely tessellated with darker lines, and central part blackish, with a short reddish stripe on either side containing pale yellow spots.

Cockerell placed this species and *L. scrobiculatum* in the genus *Akermes* with some South American coccids, "distinguished by their globular form round chitonous areas on the skin, and microscopical tessellation of the larvæ."

893. *Akermes levis*. Cat. Coccidæ, p. 178.

Lecanium longulum, Douglas. (Plate XIII, fig. 2.)

Ent. Monthly Magazine, vol. xxiv, p. 97. 1887.
Lecanium chirimoliæ, Mask., *Trans. N. Zealand Inst.*, vol. xxii, p. 137, pl. iv, figs. 5–15. 1889.
Lecanium longulum, Newstead. *Mon. British Coccidæ*, vol. ii, p. 86, pl. 4, figs. 11–14 1902.
Calymnatus longulum, Cockerell, *The Industrialist*, p. 220. April, 1899.

This is a more or less tropical species, supposed to be a native of the West Indies, and spread chiefly with hothouse plants and on tropical fruits. It is not recorded from Australia in Mrs. Fernald's catalogue, but I have specimens upon custard apple (*Anona reticulata*), sent from Darwin (Northern Territory), by Mr. G. F. Hill.

Adult female yellowish brown, smooth, shining, elongate, much longer than broad, rounded at the extremities, convex. On some plants this species becomes much broader, and resembles *L. hesperidum* in general form, but typical specimens are long, slender, and semi-cylindrical. It can be distinguished from the former by the long stout eight-jointed antennæ, and the derm cells being nearly twice as numerous. In *L. hesperidum* the antennæ are seven-jointed. Length, $\frac{1}{8}$ inch. Maskell described his species from Fiji upon the same food-plant (custard apple).

850. *Coccus longulus.* Cat. Coccidæ, p. 171.

Lecanium melaleucæ, Maskell. (Plate XIII, fig. 6.)

Trans. N. Zealand Institute, vol. xxx, p. 239, pl. xxvi, figs. 3–8. 1898.
King, *Canadian Entomologist*, 1902 p., 60.

This fine species was collected upon ti-tree (*Melaleuca* sp.) bushes growing on Palmer Island, Clarence River, New South Wales.

In a list of the coccidæ of Massachusetts, King lists this species as one introduced into the United States upon *Monstera deliciosa*, growing in a hothouse at Harvard University. If his identification is correct, it is a most remarkable instance of a rare Australian coccid (only recorded from the one locality) being introduced on a hothouse plant.

The adult female is reddish brown, slightly convex, tapering behind, without distinct dorsal carinæ; epidermis, slightly rough, with minute pustules; sometimes the dorsal surface is ornamented with white, waxy tufts. Length, from $\frac{1}{5}$ to $\frac{1}{4}$ inch.

The male puparium forms a thin, glassy test, with the centre covered with additional snow-white, waxy secretion. Length, $\frac{1}{11}$ inch.

1409. *Lepidosaphes melaleucæ.* Cat. Coccidæ, p. 311.

Lecanium mirificum, Maskell.

Trans. N. Zealand Institute, vol. xxix, p. 312, pl. xx, figs. 7–14. 1897.
Saissetia mirifica, Cockerell and Parr., *The Industrialist*, p. 146. 1899.

The type specimens found on the foliage of the "Weeping Myall" (*Acacia pendula*), growing in the Mallee Scrub, North-West Victoria.

Adult female dark brown to yellowish brown, very convex, with a flattened broad margin right round. At the apex of the dorsum there are two rows of rather deep subcircular pits, varying from four to six in number. The abdominal cleft normal, with the dorsal lobes small. Length, up to ½ inch; width, ⅓ inch; and height, ¼ inch. The immature coccids are finely granulated on the dorsal surface, numerous yellow spots showing through the uniform brown colouration.

The large size of the adult female, with the distinctive pits in the centre of the back, and the broad, marginal flange, gives it a very distinctive character.

995. *Saissetia mirifica.* Cat. Coccidæ, p. 204.

Lecanium nigrum, Nietner. (Plate XIII, fig. 7.)

Enemies of the Coffee, p. 9. 1861.
Douglas, *Ent. Month. Magazine*, vol. xxvii, p. 95 1891.
Green, *Indian Museum Notes*, 1889 and 1896; *Coccidæ Ceylon*, 1896.
Maskell, *The Entomologist*, vol. xxvii, p. 166. 1894.

This is a tropical species found originally upon coffee, but since recorded upon many other Indian plants and shrubs, and introduced into New Zealand and Australia. Maskell considers that *Lecanium depressum* and *L. begoniæ* are identical with this species, and Green follows him, but Mrs. Fernald gives all three specific rank.

It is common in Australia upon our Pittosporum hedges, the dark black oval females covering the leaves.

Adult female elongate oval, very convex, smooth shining, reddish-brown to black in colour. Length, 4 mm.

Treated with oil of cloves, it assumes a rich reddish-brown tint, with the outer irregular flanged basal margin bright yellow; above this margin is a dark brown band, with the whole of the dorsal surface tessellated with distinct irregular-rounded or six-sided spots, giving them a very distinctive character.

996. *Saissetia nigra.* Cat. Coccidæ, p. 204.

Lecanium oleæ, Bernard. (Plate XIII, fig. 8.)

Chermes oleæ, Mem. d'Hist. Nat. Acad. Marseilles, p. 108. 1782.
Walker, *Brit. Mus. Catalogue*, Homoptera, p. 1070. 1852.
Signoret, *Ann. Soc. Ent. France*, vol. iii, p. 440. 1902.
Newstead, *Monog. Brit. Coccidæ*, vol. ii, p. 126. 1902.

This is the common "Olive Scale" of Europe, which was probably introduced into Australia at a very early date. It is cosmopolitan in its range, and found on many different food-plants. In our orchards it is popularly known as the "Brown Bug."

In the orchard it is chiefly a pest of the citrus trees, spreading over the twigs and foliage, and in badly infested trees, sometimes found upon the stalk and base of the fruit. The adult females discharge a large amount of honey dew, which, coating the leaves and twigs with a varnish of sugary matter, is again infested with smut or fumagine which blackens and disfigures the whole of the foliage, and can only be removed by spraying.

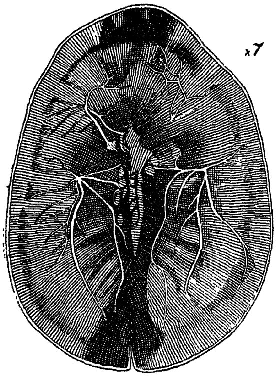


Fig. 1.

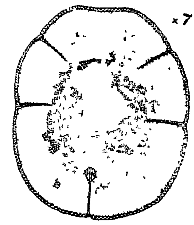


Fig. 2.

[Fig. 3.

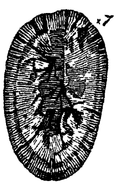
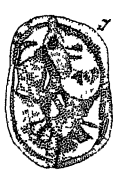


Fig. 4.



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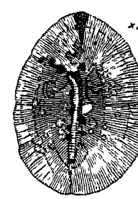

Fig. 6.

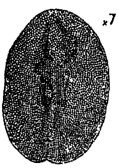

Fig. 7.

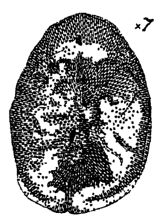

Fig. 8.

Fig. 9.

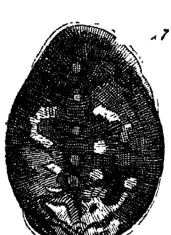

Fig. 10.

Fig. 11.

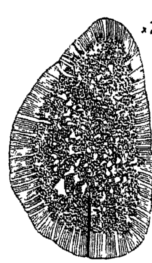

Fig. 12.

Fig. 1.—*Lecanium berberidis*. **Fig. 2.**—*Lecanium expansum*. **Fig. 3.**—*Lecanium filicum*. **Fig. 4.**—*Lecanium frenchi*. **Fig. 5.**—*Lecanium hemisphæricum*. **Fig. 6.**—*Lecanium melaleucæ*. **Fig. 7.**—*Lecanium nigrum*. **Fig. 8.**—*Lecanium oleæ*. **Fig. 9.**—*Lecanium pattersoniæ*. **Fig. 10.**—*Lecanium scrobiculatum* **adult. Fig. 11.**—*Lecanium scrobiculatum*, **immature. Fig. 12.**—*Lecanium tessellatum*.

Species of *Lecanium* treated with oil of cloves, and drawn from microscopic mounts.

SCALE INSECTS OF AUSTRALIA. PLATE XIII.

Fig. 1.—*Lecanium berberidis.*

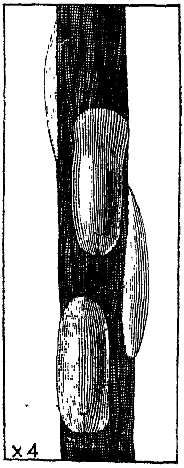

Fig. 2.—*Lecanium longulum.*

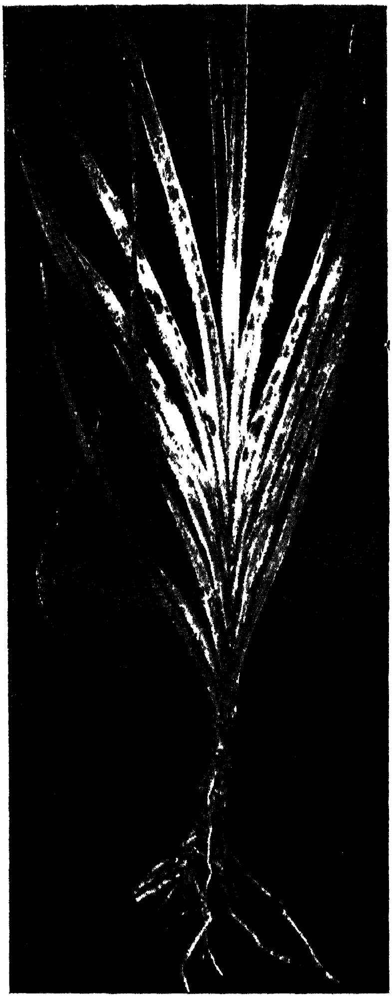

Fig. 3.—*Lecanium pattersoniæ.*

SCALE INSECTS OF AUSTRALIA. PLATE XIV.

Adult female almost hemispherical, very convex, or irregularly rounded; dull reddish-brown, to almost black; the outer margins irregular, the dorsal surface keeled in typical specimens with two short transverse ridges and a central ridge. Often covered with a slight waxy secretion broken up into white dots. Length, 4 mm.

At the final stage of development she is a thickened leathery sac, shrunken beneath, with the cavity full of eggs or larvæ.

Puparium of male rare, but of the typical lecanid form, "studded with irregular waxy plates." (Green).

998. *Saissetia oleæ.* Cat. Coccidæ, p. 205.

Lecanium pattersoniæ, Maskell. (Plate XIII, fig. 9, and Plate XIV, fig. 3.)

Trans. N. Zealand Institute, vol. xxvii, p. 57. 1894.

This elongate lecanid confines itself to the foliage of *Patersonia glabrata* (a small blue-flowering plant belonging to the Iris family), common on the sandstone country about Sydney.

An infested plant has all the leaves covered with white woolly filaments enveloping the coccids beneath.

The adult female is reddish-brown in the centre, with a broad central clear parallel stripe (carina) with a row of dark spots down each side; the whole finely tessellated with the margins yellow, and lightly covered with a white waxy secretion. General form elongate, boat-shaped, convex, the extremities rounded; two small indentations on either side, from each of which a fine transverse line runs up the side, merging into the dorsal carina. Length, $\frac{1}{5}$ inch. Under-surface very convex, legs and antennæ well developed; the lines from the marginal indentation outlined on the ventral surface with a white secretion. The whole margin fringed with short irregular setæ or hairs.

Male test composed of fine semi-transparent waxy plates, impressed on the sides; of the usual elongate form. Length, $\frac{1}{10}$ inch.

1030. *Lecanium patersoniæ.* Cat. Coccidæ, p. 212.

Lecanium persicæ, Geoffroy.

Chermes persicæ, Histoire abregé des Insectes. 1762.
Coccus persicæ, Fab., *Gen. Ins.*, p. 301. 1776.
Lecanium rosarum, Snellin van Vollenhoven (Maskell, *T. N.Z. Inst.*, 1891, p. 22).
,, *cymbiformis*, Targ. *Catalogue*, p. 37. 1869.
,, *sarothamni*, Douglas *Ent. Month. Mag.*, vol. xxvii, p. 65. 1891.
,, *assimile*, Newstead, *Ent. Month. Mag.*, vol. xxviii, p. 141. 1892.
,, *persicæ*, Newstead, *Monog. British Coccidæ*, vol ii, p. 89. 1902.

This widely distributed species, originally a native of Europe, is now recorded from the United States, and from Australia, by Maskell, upon gooseberry twigs from Melbourne, Victoria. In Mrs. Fernald's catalogues its food-plants include the grape vine, peach, mulberry, plum, nectarine, and Japanese quince.

"Adult female dark red to reddish-brown, semi-globular, sometime, elongated; epidermis smooth, showing some minute transverse wrinkles. Diameter, $\frac{1}{10}$ to $\frac{1}{5}$ inch." (Maskell).

Newstead says: "Adult female dusky yellow, dorsal area usually paler, with from eight to nine transverse bands formed of blackish and more or less distinct confluent spots. After parturition, the blackish markings disappear and the colour changes to light reddish-brown or dark castaneous. Form elongate ovate and highly convex or rarely short ovate and almost hemispherical."

951. *Eulecanium persicæ.* Cat. Coccidæ, p. 191.

Lecanium pseudexpansum, Green.

Bulletin of Entomological Research, vol. v, part 3, p. 233. 1914.

This species was sent to Mr. Green from Port Darwin, Northern Territory of Australia (G. F. Hill), upon the foliage of a "Screw palm" (*Pandanus odoratissimus*).

This species is closely allied in colour, structure, form, and size to *Lecanium expansum*, but differs in having simple marginal setæ instead of flabelliform setæ, as in *L. expansum*.

Green, after giving a technical description of this new species, says: "Nor is the resemblance purely superficial, for the structure of the antennæ, the absence of limbs, and the disposition of the pre-anal ceriferous pores are al common in the two species. The male puparium of the two species are indistinguishable."

Lecanium scrobiculatum, Maskell. (Plate XIII, figs. 10 and 11.)

Trans. N. Zealand Institute, vol. xxv, p. 221, pl. xiii, figs. 5-7, 1892; vol. xxvii, p. 58, 1894; vol. xxviii, p. 391, 1896.
Lecanium pingue, Trans. N. Zealand Institute, vol. xxvii, p. 58, 1904; vol. xxviii, p. 391, 1896.
Kermes pinguis, Cockerell, *Ann. Mag. Nat. Hist.*, vol. ix, p. 453. 1902.

A common species upon *Acacia decurrens*, Mittagong (New South Wales), and on *Dillwynia juniperina*, Bankstown (New South Wales). Found in other localities about Sydney, and at Whitton (New South Wales), on *Acacia* sp.

The type was described from Whitton; the specimens from Bankstown were described under the name of *Lecanium pingue*, but Maskell afterwards considered the differences were more local than specific.

Adult female varying from bright reddish-brown, usually darkest in centre, to dull brown, covered with a fine waxy secretion, giving it a shiny varnished appearance, with deep circular pits on the dorsal surface; central radiating blotches and margin pale yellow. Very convex, humped in centre, longer than broad, with the margin forming a distinct flange; the front portion projecting like the toe of a shoe; the dorsum ridged with a row of six stout tubercules, the first separated from the following five, followed by a more irregular row of five on either side, with a row of four yellow pits on either side between the dorsal and lateral tubercules. Length, $\frac{1}{8}$ inch.

Lecanium synapheæ, n.sp.

This fine species comes from Boyanup, West Australia, and was found by Mr. L. J. Newman, covering the curious serrate foliage of *Synaphea petiolaris*.

Adult female reddish-yellow in the centre with the outer margin pale yellow. Treated with oil of cloves, the pale outer margin shows a ring of irregular brown spots, and the central darker portion shows a tessellated pattern of egg-shaped bodies bedded in darker brown. Dorsal surface covered with a white mealy wax-like white bloom, and the outer margin fringed with fine setæ. General form broadly rounded, flattened, or very slightly convex on the dorsal surface, rounded on the margins, but showing two slight indentations on either side from which run up transverse lines meeting the short carina in the centre of dorsum; anal opening and cleft large; ventral surface flattened with four white transverse lines in centre; legs long and slender; rostrum large; antennæ long, slender. Length, $\frac{1}{7}$ inch; diameter, $\frac{1}{9}$ inch.

Male test white, semi-opaque, slightly granulated and mealy; elongate oval; upper surface smooth, convex, not angulated, with fine white lines traversing the dorsum and joining in a V-shaped point at the anal opening. Length, $\frac{1}{16}$ inch.

This species comes near *Lecanium expansum* in its broad flattened form and lateral constrictions

Lecanium tessellatum. Signoret. (Plate XIII, fig. 12, and Plate XV, fig. 1.)

Ann. Soc. Ent. France (5), vol. iii, p. 401. 1873.
Douglass, *Ent. Monthly Magazine*, vol xxiv, p. 25. 1887.
Cockerell, *Ann. and Mag. Nat. Hist.* (7), vol. ix, p. 453. 1902.

This *Lecanium* has been introduced into Australia on hot-house plants, and is common on palms, ferns, &c. Signoret described the type upon the foliage of a palm (*Caryota ursus*) at Montpellier; Maskell described it on the foliage of *Laurius nobilis*, from Sydney. In the Botanic Gardens, Sydney, it is common on many plants, but is nearly always found upon *Coccoloba platyclada*, a curious flat-leaved plant, native of the Solomon Islands.

The adult female is flat, slightly convex, very irregular in form, but usually broad oval, narrowest in front. and one side more arcuate than the other, which may be almost straight. When alive it has a greenish tint, which fades into a reddish-brown in the centre surrounded with a dull yellow margin. The whole surface is covered with fine reticulations, with the outer margins having two deep indentations on either side, with distinct lines running across to the dorsum, while the whole is distinctly broken with finer transverse lines, so that it looks as if the margin was made up of a number of plates, with a fringe of fine scattered hairs or setæ along the edge. Antennæ and legs well developed. Length, $\frac{1}{5}$ of an inch.

Male tests crystalline white

837. *Eucalymatus tessellatus*. Cat. Coccidæ, p. 166.

Genus XXIII. *Cryptes*, Crawford.

Maskell, *Trans. N. Zealand Institute*, vol. xxiv, p. 21. 1891.
Cockerell, *Canadian Entomologist*, vol. 33, p. 58. 1901.

This generic name was given to this species by Mr. Crawford, of Adelaide, when sending the types to Maskell for description. The latter, however, dropped the name of *Cryptes*, and described it in the Genus *Lecanium*, to which it is closely allied. Cockerell, when defining his subdivision of the Genus *Lecanium*, defined this genus on the male characters, "Male scale felted, sub-cylindrical, with a glassy operculum." Remarkable changes take place in form and colour of the female during the different stages of her development. from the biscuit pale-brown colour and shoe-like form to the blue coloured berry form, and final thick-set, dark brown, pear-shaped form. If the three distinct forms had been sent without any information as to their affinities to some of our earlier authorities on coccids, I am sure they would have created three species.

Cryptes baccatum, Maskell. (Plate XV, figs. 2 and 3.)

Lecanium baccatum, *Trans. N. Zealand Institute*, vol. xxiv, p. 20, pl. ii, fig. 8 16, 1891; vol. xxv, p. 217, 1892; vol. xxix, p. 311, 1899.
Lecanium baccatum, Fuller, *Trans. Ent. Soc. London*, p. 458. 1899.

This fine coccid has a very wide range over Australia on different species of Acacias. having been found at Adelaide (South Australia), on *Acacia armata*, Crawford; Sydney (New South Wales), on *Acacia linearis*, *A. longifolia*, *A. decurrens*, and *A. pendula*, Froggatt; Western Australia, on *Acacia melanoxylon*, and *A. calamifolia*, Fuller. The male and female coccids thickly encrust the infected twigs and branches of these wattles.

Adult female brownish yellow, smooth, shining, broadly rounded to the summit and contracted almost to a stalk with irregular rounded aperture, the roughened corrugated edges attached to the bark giving a general thick-set pear-shaped form. Often very irregular, both in size and form, when thickly massed together on the twigs, as they generally are upon the acacia. Average width, $\frac{1}{3}$ inch, and nearly as high. At this stage simply a thickened leathery or horny bag, with the antennæ, legs, and rostrum aborted on to the inner surface.

The immature female coccids are usually of a shiny slate-blue tint, and are more elongate, oval or berry-shaped in form, with the opening on the hind portion of the back distinct and often when observed, particularly in the early morning, covered with a globule of clear honey-dew. In the earlier stage the colour is light yellowish-brown, the general form elongate, oval, tapering behind and round on the sides, convex, but flattened on the back, and showing two or more parallel lines of shallow punctures or depressions; the apical orifice large, irregularly rounded, and dark brown towards the front. Maskell says the antennæ are eight-jointed and feet rather slender. In the immature, or earlier stages of development, the coccids rest upon a slight pad of cottony secretion.

Fig. 1.—*Lecanium tessellatum.*

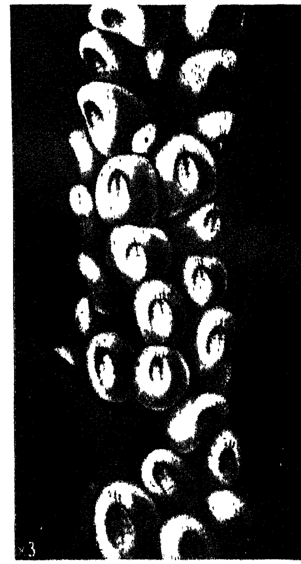

Fig. 2.- *Cryptes Laccatum* (young females).

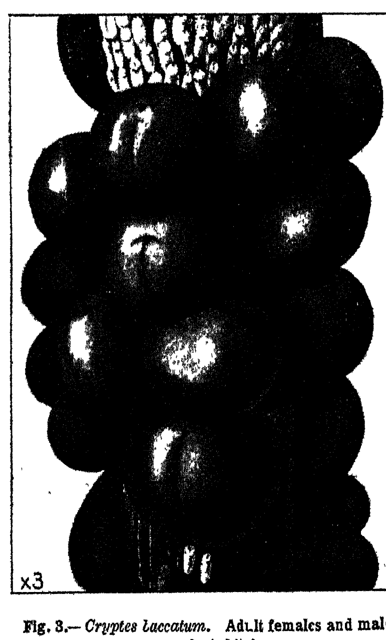

Fig. 3.—*Cryptes laccatum.* Adult females and male puparia (white).

SCALE INSECTS OF AUSTRALIA. PLATE XV

The male coccids are enclosed in white sub-cylindrical, closely felted, cottony puparia, the ends of which are closed with a thin glassy plate in which there is a small orifice. Length, about $\frac{1}{24}$ of an inch. These male puparia often cluster along a small twig with their base of attachment surrounded with white cottony secretion, and quite separate from the females.

1099. *Cryptes baccatum.* Cat. Coccidæ, p. 209.

Genus XXIV. *Alcerda*, Signoret.

Ann. Soc. Ent. France, vol. iv, p. 46. 1874.
Newstead, *Monog. British Coccidæ*, vol. ii, p. 10. 1903.

This genus was created by Signoret for a lecanid coccid living underground in Southern Europe on grass. The female has no legs or antennæ, and is covered with a felted ovisac. The larvæ are very elongate, with parallel sides; the margins of the body fringed with fine short bristles. Six species have been described in different parts of the world, and though few in number, the genus has a very wide range over Europe, California, Japan, and Natal.

Alcerda sella-hispanica, Lindenger.

Die Fauna Sudwest Australiens, Bund. iv, p. 8. 1913.

The species comes from North Fremantle, Western Australia.

"Adult female brown; broad elliptical, depressed in the centre, with longitudinal carina down the dorsum, margin with few spines, rounded at apex, anal segment broad and tooth-shaped. Antennæ and legs, wanting or aborted. Length, 3 mm., 2 mm. broad, and 1 mm. in height."

(*To be continued.*)

Dairy Science School at Byron Bay.

In connection with the announcement made that the Department of Agriculture had arranged to hold a Dairy Science School at Byron Bay as from 26th July, it has now been found advisable to postpone the school for two weeks, and it will now open on the 9th August, as the latter date is more convenient for those concerned. Alterations are being made at the Byron Bay Butter Factory, and as these will be completed before the opening date of the school, students will have full advantages of and access to the pasteurising machines and to the culture room, where the lactic ferment is prepared for ripening the cream.

Applications, accompanied by the fee of 5s. for admission to the course for either one or two weeks, will be received by the Under Secretary, Department of Agriculture, Sydney, until 28th July.

Grafton Experiment Farm.

ANNUAL REPORT OF DEMONSTRATION AREA, 1913-14.

A. H HAYWOOD, Manager.

THIS area consists of 63½ acres of good second-class land, valued at £30 per acre.

The situation and system of cropping has been previously described in the *Agricultural Gazette* for April, 1914.

The rainfall for the year under review was as follows:—

1913.	Points.	1914.	Points.
July ...	... 148	January ...	... 317½
August ...	... 14	February ...	... 214
September ...	... 401	March ...	... 531
October ...	... 59	April ...	... 36
November ...	... 214	May ...	... 431
December ...	... 288	June ...	... 450
Total ...	... 31 inches 3½ points.		

The distribution was abnormal, and the low fall in October resulted in the dead loss shown in the potato crop, whilst the uneven falls of the autumn months appreciably reduced the yield of the 60 acres of Leaming maize.

The year's working has not been nearly so favourable as that of the previous year. On the balance-sheet, as submitted in July, 1914, for the Annual Report of the Department, based on actual farm costs, a loss of £168 3s. 10d., or £2 12s. 11¾d. per acre, was revealed. However, as shown further on, the maize then held at a valuation was finally sold from six to eight months later at considerably enhanced values and the loss much reduced in consequence.

Computing the costs at district farm rates, and the proceeds at actual disclosed selling prices, the area shows a profit of £201 15s. 6d., or £3 3s. 6½d. per acre, for the whole area.

On 30th June, 1914, the whole of the ground was left clear and ready for the plough for the succeeding crops, and all costs prior to that are included in the appended statements.

PROFIT AND LOSS ACCOUNT OF DEMONSTRATION AREA—63½ acres.

Dr.	£ s. d.	*Cr.*	£ s. d.
To Rental value at 30s. per acre	95 5 0	By Crops	508 1 10
,, Wages and salaries ...	363 16 6	,, Balance	168 3 10
,, Horse cost	60 2 4		
,, Seeds, bags, &c.	129 4 7		
,, Hire of machinery and supplies from other branches	27 17 3		
	£676 5 8		£676 5 8

The above represents actual farm costs, and on the credit side includes, as on 30th June, 1914, an estimated amount of 1,980 bushels of maize then in the barn and valued, with its seed content, at 3s. 6d. per bushel. The larger proportion was not dealt with till the month of December, 1914, and January and February, 1915, with the result that a much larger seed content was obtained than anticipated, and the feed grain portion realised (owing to drought and war conditions) up to 4s. 9½d. per bushel. This will explain the difference with the figures on the credit side quoted in the summary "at farmers' rates," which was not prepared until all the maize had been finally disposed of and accounted for.

SUMMARY OF INDIVIDUAL CROP ACCOUNTS.

Costs computed at district farmer's rates.

Area.	Crop.	Variety.	Profit.	Loss.
Acres.			£ s. d.	£ s. d.
No. 1.—26¾	Maize	Improved Yellow Dent...	96 1 10	....
,, 2.—16	Potatoes ...	Satisfaction	....	70 9 6
,, 3.— 3¼	Wheat for hay	Warren	9 16 4	....
,, 4.—60*	Maize	Leaming	166 6 10	....
		Balance (Profit)	....	201 15 6
		£	272 5 0	272 5 0

* 46 acres of this area was double cropped.

No. 1.—Maize for Grain, 26¾ acres. Variety, Improved Yellow Dent.

Dr.

	£	s.	d.
Ploughing, double-furrow disc, at 7s. 6d. per acre	10	0	8
Harrowing, tine, at 9d. per acre	1	0	0
Seed, 10 lb. per acre at 7s. 6d per bushel	1	15	9
Planting with corn planter, at 1s. 6d. per acre	2	0	2
Harrowing, tine, at 9d. per acre	1	0	0
Hilling, with disc hiller, at 1s. 7d. per acre...	2	2	5
Pulling and threshing, with power machine, at 17s. 6d. per acre	23	8	1
Hand picking and treating 180½ bushels, sold for seed, extra cost 2s. 6d. per bushel	22	11	3
Bags for seed and proportion of crop sold, 15 doz. at 7s. 6d.	5	12	6
Cartage to wharf of proportion sold—462 bushels at 1d. ...	1	18	6
Chopping down stalks (chopping roller) and cleaning up, at 1s. 7d. per acre	2	2	5
Rent, 26¾ acres of land, 8 months at 30s. per acre... ...	26	15	0
Balance	96	1	10
	£196	8	7

Cr.

955½ bushels of grain harvested=35·71 bushels per acre, and disposed of as under:—

	£	s.	d.
157½ bushels sold locally at prices from 3s. 8d. to 3s. 9d. per bushel	28	19	10
18 bushels sold to farm hands, at 3s.	2	14	0
468 bushels used for horses, pigs, and poultry, at 3s. per bushel	70	4	0
131½ bushels transferred to other Departmental Farms, at 4s. 1d. per bushel	26	17	0
7 bushels seed transferred to other Farms at 7s. 6d. per bushel	2	12	6
173½ bushels seed maize sold in small lots to farmers at 7s. 6d. per bushel	65	1	3
	£196	8	7

Notes.—Followed Spring, 1912, potato crop. Partly grown in year 1912–13, but included in year 1913–14 accounts. *Vide* paragraph in April, 1914, *Agricultural Gazette*, page 325, regarding this crop.

No. 2.—Potatoes, 16 acres. Variety, Satisfaction. Spring Crop, 1913.

Dr.

	£	s.	d.
First ploughing, double-furrow disc, at 7s. 6d. per acre ...	6	0	0
,, rolling, at 9d. per acre	0	12	0
,, harrowing, tine, at 9d. per acre	0	12	0
Seed, 9 cwt. to acre, at £10 per ton, landed at farm ...	72	0	0
Cutting seed, at 10s. 6d. per acre	8	8	0
Ploughing in seed, double and single furrow ploughs, at 7s. per acre	5	12	0
Dropping potatoes, at 3s. 4d. per acre	2	13	4
Second harrowing, at 9d. per acre	0	12	0
Third ,, ,, ,, ...	0	12	0
Twice scuffled, double cultivator, at 1s. 9d. per acre ...	2	16	0
Sprayed, once, 5-row sprayer, at 5s. per acre	4	0	0
Hilling, single-furrow plough, at 2s. 4d. per acre	1	17	4
Ploughing out, picking up and bagging 180 bags, at 1s. ...	9	0	0
Bags (some used twice on farm), 15 doz. at 7s. 6d.... ...	5	12	6
Cartage to wharf and rail—165 bags, sold and transferred, at 3d....	2	1	3
Harrowing tops and levelling ground, at 9d. per acre ...	0	12	0
Rent of land or six months, at 30s. per annum	12	0	0
	£135	0	5

Cr.

	£	s.	d.
23 tons 2 cwt. 2 qrs. potatoes, all grades, equivalent to a return of $1\frac{1}{2}$ tons per acre in round figures, disposed of as under:—			
156 bags, weighing 13 tons 5 cwt. 1 qr., sold (152 Sydney, 4 locally) at prices £4 to £7 per ton, for a net cash return	53	18	2
3 cwt. consumed at quarters, at 5s.	0	15	0
1 cwt. 3 qrs. transferred to Wollongbar Farm	0	12	3
10 cwt. 2 qrs. reserved for seed for autumn crop, at 9s. per cwt.	4	14	6
9 tons 2 cwt. pig potatoes, at 10s. ton	4	11	0
Balance	70	9	6
	£135	0	0

Notes.—See extract from 1913-14 Annual Report, folio 109, "The shortage of rain in October affected the potato yield very seriously, and the final yields were extremely low, in fact the lowest for the past seven years."

The crop was a failure, the total returns being less than the cost of the seed

No. 3.—Wheat for Hay, $3\frac{1}{4}$ acres. Variety, Warren.

Dr.	£	s.	d.	*Cr.*	£	s.	d.
Ploughing, single-furrow, at 8s. per acre	1	6	0	Yield, 3 tons 16 cwt. hay (slightly over 1 ton 3 cwt. per acre), used on farm, and valued at local district rate of £4 10s. per ton	17	2	0
Harrowing, tine, at 9d. per acre	0	2	6				
Seed, $1\frac{1}{2}$ bushels per acre, at 7s. 6d.	1	16	6				
Broadcasting, at 6d. per acre	0	1	8				
Harrowing in, at 9d. per acre	0	2	6				
Mowing, at 1s. 3d. per acre	0	4	1				
Making hay, loose (raking and cocking), at 3s. 3d. per acre	0	10	7				
Carting to shed, $3\frac{3}{4}$ tons, at 3s. 6d. per ton	0	13	1				
Rent of land for 6 months, at 30s. per acre	2	8	9				
Balance	9	16	4				
	£17	2	0		£17	2	0

Note.—This wheat was actually sown with a drill, and cut with a reaper and binder, at less cost, but as none of these machines have yet been introduced by district farmers, the figures have been prepared in accordance with usual district practice.

No. 4.—Maize for Grain, 60 acres. Variety, Leaming.

Dr.

Acres		£	s.	d.
40¾	*acres following previous maize crop, and including area of 26¾ acres, referred to in No. 1.*			
	First ploughing, double-furrow disc, at 7s. 6d. per acre	15	5	8
	First rolling, at 9d. per acre	1	10	7
	First harrowing, tine, at 9d. per acre	1	10	7
	Second ploughing, double-furrow disc, at 7s. 6d. per acre	15	5	8
	Second harrowing, tine, at 9d. per acre	1	10	7
16	*acres following potato crop, referred to in No. 2.*			
	Ploughing, double-furrow disc, at 7s. 6d. per acre	6	0	0
	Harrowing, tine, at 9d. per acre ...	0	12	0
3¼	*acres following hay crop, referred to in No. 3.*			
	First ploughing, single-furrow mouldboard, at 8s. per acre	1	6	0
	First harrowing, tine, at 9d. per acre	0	2	6
	Rolling, at 9d. per acre	0	2	6
	Second ploughing, double-furrow disc, at 7s. 6d. per acre	1	4	4
	Second harrowing, at 9d. per acre ...	0	2	6
60	*acres* planted at rate of 10 lb. seed per acre = $10\frac{10}{14}$ bushels of seed, at 7s. 6d. per bushel	4	0	4
	Planting with corn planter, at 1s. 6d. per acre	4	10	0
	Scuffling with tine scuffler, 60 acres, at 1s. 4d.	4	0	0
	Second scuffling, 40¾ acres, at 1s. 4d. per acre	2	14	4
	Harrowing, tine, 16 acres, at 9d. per acre	0	12	0
	Hilling, disc hiller, at 1s. 7d. per acre	4	15	0
	Pulling and threshing, with power machine, at 17s. 6d. per acre ...	52	10	0
	Hand picking and treating, proportion used and sold for seed = 275¾ bushels, at 2s. 6d.	34	9	4
	Bags for proportion sold, 36 doz. at 7s.	12	12	0
	Cartage to wharf of proportion sold = 1,299 bushels, at 1d. ...	5	8	3
	Chopping down stalks (chopping roller), and cleaning up, at 1s. 7d. per acre	4	15	0
	Rent at 30s. per acre per annum :—			
	26¾ acres for 10 months = £33 8 9			
	16 ,, 6 ,, = 12 0 0			
	3¼ ,, 6 ,, = 2 8 9			
	14 ,, 12 ,, = 21 0 0	68	17	6
60				
	Balance	166	6	10
		£410	3	6

Cr.

Bushels		£	s.	d.
2,069	bushels of grain harvested, equivalent to a yield of 34·48 bushels per acre, and disposed of as under :—			
255¼	bushels for seed, sold in small lots to farmers, at 7s. 6d. per bushel...	95	14	4
12	bushels seed, transferred to other Departmental Farms, at 7s. 6d. ...	4	10	0
8½	bushels reserved for seed for farm, at 7s. 6d. per bushel	3	3	9
147¾	bushels feed grain transferred to other Departmental Farms, at prices from 3s. 6d. to 3s. 9d. per bushel	26	3	5
884½	bushels of feed grain sold in Sydney, at from 3s. 2d. to 4s. 9d. per bushel	166	9	0
58	bushels of feed grain sold to farm hands, at 3s. per bushel	8	14	0
703	bushels of feed grain used for horses, fowls, and pigs on farm, at 3s. per bushel	105	9	0
2,069				
		£410	3	6

Note.—This crop suffered from a capricious rainfall. Maize crops in paddocks adjoining yielded at the rate of 70 and 58 bushels per acre respectively.

Poultry Notes.

JAMES HADLINGTON, Poultry Expert.

July.

The decision of the Government to import wheat for poultry food to tide over the shortage until harvest time, together with the good soaking rains that have fallen over the wheat-growing country during the last few weeks, has very materially improved the outlook for those engaged in the poultry industry. There seems little reason, so far as the prospects are concerned, why the motto of poultry keepers should not be, "hatch chickens as usual," if not on a larger scale, and so partly replenish the depleted flocks resulting from the scarcity and high prices of food stuffs. High prices must, of course, be expected to continue close up to the end of the year, but since harvest time commences about the end of November, prices might reasonably be expected to ease from that time on. As pointed out in previous Notes, the food consumed during the early months of chickenhood is not great, and the total cost of production should not under these circumstances prove much above normal, in view of the prospects of cheaper feed before reaching a stage of heavy food consumption. At any rate, a little extra cost in production is likely to be more than balanced by the probable higher prices for poultry products next year, especially eggs, consequent upon reduced flocks of layers.

Taken altogether, the outlook for the poultry farmer who can manage to survive the next few months, is not altogether unpromising. Even admitting that wheat may be in heavy demand for export, and that there are facilities for getting it away, it should be remembered that our wheat areas have been largely extended, and even with a normal average per acre, there is likely to be a very large increase in production, and a proportionately large amount of chickwheat available for local requirements. This class is not likely to be exported, therefore, there would seem no reason to anticipate that chickwheat or mill offal will rule much above normal in price after the harvest. Of course, anything might happen to estimates; but now that we are at the commencement of hatching time, it is as well to view matters in the light of present prospects, with the idea of getting a perspective of the conditions likely to operate during the rearing season; because a hatching season missed would mean the loss of nearly half the producing capacity of the poultry industry, the value of which is estimated at nearly two millions, and my view is that there should be no relaxation on the part of poultry keepers in their endeavours to secure a liberal crop of chickens.

Hatching Season.

Preparation should now be well in hand for the hatching season, and in fact, the first batches of all the dual purpose and heavy breeds should by this time be due to hatch and others following on. A scarcity of eggs for setting will, of course, have been a drag on operations up to this time, but the position in this respect should be easier, and more eggs should become available as July progresses. The end of the first week in this month is a good time to put down the first batches of eggs of all the Mediterranean breeds, such as Leghorns, remembering that August will be upon us by the time they are due to hatch. Many poultry keepers are tardy in hatching Leghorns before the middle of August on account of the danger of many pullets breaking into moult before next winter; but, all things considered, it is better to have a few out too early than the same quantity too late; they should at least lay a lot of eggs before they go into moult, and they would make good breeding stock for the following year.

How to Secure Successful Hatching

The principal factor making for successful hatching is strong vigorous breeding stock, kept under conditions which encourage constant exercise. Next to that, skilful feeding and proper attention. The first is the more important factor, but the maintenance of that condition depends very largely upon the second, because no matter how good the breeders may be, and whatever their strain or breeding, a lengthened confinement without provision for exercise, especially if coupled with unskilful feeding, is quite sufficient to produce a stagnant state of health that is fatal to good hatching results. This matter cannot be too strongly emphasised, because it is of more importance to secure good strong virile chickens than is any question of breed or strain, and it is only by focussing attention upon this all-important fact that we can free poultry farming from many of its worries, and make it a profitable pursuit. Wastage in rearing, and the culling out necessary when the stock is weedy, constitutes one of the greatest drawbacks in connection with poultry farming. If a breed is so low in vitality as to make rearing difficult, unprofitable operations are certain to result.

Feeding the Stud Birds.

Correct methods of feeding are essential to keep even good birds in robust health, and is of equal importance with that of the kind of food being fed, providing always that it is a sound class of food. A great many poultry-keepers, particularly beginners, are given to speculating upon food analyses and nicely balanced rations before they have acquired the rudiments of skilful feeding and attention to their birds. While a study of food values, balanced rations, &c., is to be encouraged, and, as far as practicable, brought into general practice, it is as well to remember that the power of the birds to convert different constituents to their own requirements, shows a wonderful adaptability of nature to supply its own needs. Health is the factor necessary for the exercise of these versatile powers of making the most of

any available substances. The most scientifically balanced ration, containing all necessary constituents, is of no avail without a state of health capable of assimilating the food supplied. The art of feeding correctly is not easily described; it is rather a matter of judgment on the part of the attendant in supplying the largest amount of food consistent with keeping their appetites keen. In this connection it may be mentioned that the term "full and plenty," as applied to feeding poultry, has been so misunderstood as to be construed into surfeiting birds with food, which results in producing a stagnant state of health. Such feeding is not productive of the best results, either with breeders or layers.

Artificial Incubation.

The temperature of the incubator should be got up to about 103 degrees Fah., and remain steady for at least a few hours before putting in the eggs. This, of course, reduces the temperature, but in a few hours it should again have reached 102, or about that, except in very cold weather when some hours longer may be required to reach that point, but this is of little consequence, provided the heat steadily rises to 102 under twelve hours. That temperature is about right for the first half of the time, after which it may be raised a degree. The thermometer bulb should be placed so that it just clears the eggs.

A good practice is to leave the eggs unturned for the first thirty-six hours after setting, and thereafter to turn and put back the eggs twice daily, at first allowing no more time than is actually necessary for the turning operation, but gradually increasing the period of exposure to the air by about one minute per day. The cooling would thus be from three to five minutes at the beginning of incubation, from ten to fifteen minutes about the end of the second week, and in very warm weather up to twenty-five minutes about the nineteenth day. After the ninth day turning once a day will be sufficient.

The eggs should be tested on the sixth day, and the time occupied in this should be abbreviated as much as possible, for it has a bad effect on the embryo chicken to allow the eggs to be out too long in the early stages, say, up to the fifth or sixth day; it is not unlikely that many eggs are weakened in this way. If they are being tested slowly they should be covered with a piece of flannel.

It is also necessary to remember that some operators will take twice as long as others to turn the eggs, and that the weather conditions also require to be studied. If the incubator room be cold, ten minutes, even well on in the hatch, is sufficient exposure.

Applied moisture is of no importance, because in a properly constructed incubator eggs are found to hatch equally well with or without it; personally I prefer no moisture, even in hot-air machines.

At hatching time, as soon as the first egg is chipped, no more cooling or turning should be allowed. It is well to stop turning after the eighteenth day. The temperature is all the better kept at 104 or 105 degrees after the first egg is chipped. At this stage the ventilators are better nearly closed.

Agricultural Bureau of New South Wales.

NOTES COMPILED BY H. ROSS, Chief Inspector.

Branch.	Honorary Secretary.
Albury	Mr. J. Brann, "Silvania," Racecourse Road, Albury.
Baan Baa	Mr. P. Gilbert, Baan Baa.
Balldale	Mr. H. Elrington, Balldale.
Bathurst	Mr. J. McIntyre, Orton Park.
Batlow	Mr. L. S. Chandler, Batlow.
Beckom	Mr. Peter Grant, Beckom.
Blacktown	Mr. Robert H. Lalor, P.O., Seven Hills.
Bloom Hill (O'Connell) ...	Mr. C. A. McAlister, Bloom Hill, O'Connell.
Borambil	Mr. H. A. D. Crossman, "Homewood," Quirindi.
Bungalong	Mr. G. H. Pereira, "Springdale," Cowra Road, *viâ* Cowra.
Canadian	Mr. F. W. Taylor, Public School, Canadian Lead.
Cardiff	Mr. John Cockburn, Cardiff.
Carlingford	Mr. D. K. Otton, Carlingford.
Cattai	Mr. A. J. McDonald, Cattai, Pitt Town.
Cobbora	Mr. Robert Thomson, Cobbora.
Collie	Mr. C. J. Rowcliff, Cow Plain, Collie.
Coonabarabran	Mr. H. H. Moss, Coonabarabran.
Coradgery	Mr. J. Clatworthy, Beechmore, Millpose, Parkes.
Coraki	Mr. G. E. Ardill, Bungawalbyn.
Coreen-Burraja	Mr. N. B. Alston, Coreen, *viâ* Corowa.
Courangra	Mr. S. H. Warland, Courangra, *viâ* Brooklyn.
Cowra	Mr. E. P. Todhunter, Cowra.
Crudine	Mr. F. W. Clarke, Crudine.
Cundletown	Mr. S. A. Levick, Roseneath, Cundletown.
Cundumbul and Eurimbla	Mr. J. D. Berney, Eurimbla, *viâ* Cumnock.
Deniliquin	Mr. W. J. Adams, jun., Deniliquin.
Derrain	Mr. A. P. Hunter, Red Bank Creek, Matong.
Dubbo	Mr. T. A. Nicholas, Dubbo.
Dunedoo	Mr. V. A. Florance (*pro tem*), Dunedoo.
Erudgere	Mr. Frank Hughes, Erudgere.
Fairfield	Mr. H. P. Godfrey, Hamilton Road, Fairfield West.
Fernbrook	Mr. W. Marks, Yarrum Creek, Dorrigo.
Forest Creek	Mr. W. Thompson, Forest Creek, Frogmore.
Garra and Pinecliff ...	Mr. A. S. Blackwood, "Netherton," Garra, *viâ* Pinecliff.
Gerringong	Mr. J. Miller, Gerringong.
Grenfell	Mr. G. Cousins, Grenfell.
Gunning	Mr. E. H. Turner, Gunning.
Hay	Mr. F. Headon, Booligal Road, Hay.
Henty	Mr. L. Eulenstein, Henty.
Hillston	Mr. M. Knechtli, Hillston.
Inverell	Mr. W. A. Kook, Rock Mount, Inverell.
Jerrara	Mr. A. O. Lane, Public School, Mullengrove, Wheeo.
Jindabyne	Mr. Sylvester Kennedy, Jindabyne.
Katoomba	Mr. C. Wooller, Oliva Park Farm, Katoomba.
Keepit, Manilla	Mr. J. B. Fitzgerald, Keepit, *viâ* Manilla.
Kellyville	Mr. Joseph Nutter, Kellyville.
Kenthurst	Mr. J. R. Jones, Kenthurst.
Lankey's Creek (Jingellic)	Mr. G. J. Nichols, P.O., Jingellic.
Leech's Gully	Mr. J. T. Weir, Tenterfield.
Leeton	Mr. A. V. Roux, P.O., Leeton.
Little Plain	Mr. F. S. Stening, Little Plain, *viâ* Inverell.
Lower Portland	Mr. W. C. Gambrill, Lower Portland.
Mangrove Mountain ...	Mr. A. E. Lillicrapp, Mangrove Mountain, *viâ* Gosford.
Martin's Creek	Mr. P. Laney, Martin's Creek, *viâ* Paterson.
Meadow Flat	Mr. F. J. Brown, "The Poplars," Meadow Flat, *viâ* Rydal.
Middle Dural	Mr. A. E. Best, "Elliceleigh," Middle Dural.
Milbrulong	Mr. O. Ludwig, Milbrulong.

Branch.	Honorary Secretary.
Miller's Forest	Mr. A. J. O'Brien, Miller's Forest.
Mittagong	Mr. C. Dunlop, No. 7 Farm Home, Mittagong.
Moruya	Mr. P. Flynn, Moruya.
Narellan	Mr. G J. Richardson, Narellan.
Narrandera	Mr. James Falkner, Narrandera.
Nelson's Plains	Mr. M. Cunningham, Nelson's Plains.
Nimbin	Mr. J. T. Hutchinson, Nimbin.
Orangeville	Mr. C. Duck, Orangeville, The Oaks.
Orchard Hills (Penrith) ...	Mr. H. Basedow, Orchard Hills, *viâ* Penrith.
Parkesbourne	Mr. W. H. Weatherstone, Parkesbourne.
Peak Hill	Mr. A. B. Pettigrew, Peak Hill.
Penrose–Kareela	Mr. A. J. Bennett, "Brookvale," Kareela.
Ponto	Mr. A. D. Dunkley, Ponto.
Pyangle (Lue)	Mr. T. A. Sheridan, Homestead, Lue.
Redbank	Mr. J. J. Cunningham, Redbank, Laggan.
Ringwood	Mr. Wm. Tait, Ringwood.
Robert's Creek	Mr. J. Cavanagh, Robert's Creek.
St. Mary's	Mr. W. Morris, Queen and Victoria Streets, St. Mary's.
Sackville	Mr. Arthur Manning, Sackville.
Sherwood	Mr. J. E. Davis, Sherwood.
Stockinbingal	Mr. J. Neville, Stockinbingal.
St. John's Park	Mr. J. C. Scott, St. John's Park.
Tallawang	Mr. Selwyn E. Hinder, Tallawang.
Tangmangaroo	Mr. A. Thompson, Public School, Kangiara Mines.
Taralga	Mr. Dave Mullaney, Stonequarry, Taralga.
Tatham	Mr. J. J. Riley, Tatham.
Temora	Mr. J. T. Warren, "Mortlake," Victoria-street, Temora.
Toronto	Mr. P. F. Newman, Toronto.
Tumbarumba	Mr. R. Livingstone, Tumbarumba.
United Peel River (Woolomin).	Mr. C. J. MacRae, Woolomin.
Upper Belmore River ...	———
Uralla	Mr. E. A. Neil, Uralla.
Valla	Mr. A. E. T. Reynolds, Valla, *viâ* Bowraville.
Wagga	Mr. Thos. Fraser, Aberfeldie, Wagga.
Walla Walla	Mr. B. A. Smith, Walla Walla.
Wallendbeen	Mr. W. J. Cartwright, Wallendbeen.
Walli	Mr. Geo. Edgerton, Applewood, Walli.
Wetherill Park	Mr. L. Rainbow, Wetherill Park.
Wollun	———
Wolseley Park	Mr. H. McEachern, Wolseley Park.
Wyan	Mr. C. W. Harper, Myrtle Creek Railway Station.
Wyong	Mr. Edgar J. Johns, Wyong.
Yass	———
Yetholme	Mr. N. D. Graham, "Bona Dea," Yetholme.
Yurrunga and Avoca ...	Mr. W. H. Waters, Yurrunga.

Notice to Honorary Secretaries.

It is important that a record of the meetings of the branches should be inserted in the *Agricultural Gazette*, and honorary secretaries are invited to forward to the Department a short account of the proceedings of each meeting, with a brief summary of any paper which may have been read, and the discussion that followed it, as early as possible after each meeting. Notes for insertion in the *Agricultural Gazette* must reach the Department before the 16th to ensure insertion in the following month's issue.

Insect Pests.—Quite a number of the branches have availed themselves of the Department's offer to supply a set of insects, being the common pests of the district, and the collections are now being cased. The Government Entomologist suggests that as each district has certain pests peculiar to its orchards and gardens, more useful work would be done if the members

themselves collected the local pests (orchard, garden, and stock) and sent them to the Department, where they would be arranged, mounted, a descriptive label attached, and returned to the branch. Mr. Froggatt considers that such a collection would have a far greater value, as there would be more interest attached to the specimens when the members knew exactly where the pests came from, and where and how to find them.

Sheaves of Grasses.—The Department is prepared to supply to branches of the Bureau which make application through their secretaries, collections of sheaves of grasses considered suitable for the respective local conditions.

Organisation of Branches.

An officer (Mr. A. M. Makinson) has been appointed especially to attend to the needs of branches of the Agricultural Bureau, and generally to organise this movement.

He will visit in turn every branch throughout the State, and confer with the Secretaries and members as to future operations, &c.

Secretaries will be advised in due course when this officer will pay a visit to their respective districts.

Demonstrations in Clearing Land and Subsoiling with Explosives.

A limited number of demonstrations in clearing land and subsoiling with explosives will be given by Mr. C. W. Burrows, Assistant Inspector of Agriculture, to branches of the Agricultural Bureau. Branches who wish to take advantage of this offer are requested to make early application to the Department through their honorary secretaries.

Bee-keeping

A series of lectures on bee-keeping is being arranged by Mr. R. G. Warry, Instructor in Apiculture. Secretaries, whose branches intend availing themselves of this opportunity to receive a practical insight into this branch of agriculture, are requested to make early application.

REPORTS AND NOTICES FROM BRANCHES.

Albury.

A meeting of this branch was held on 11th May, Mr. F. Wells, Chairman, presiding.

It was decided to call a special meeting to discuss the weeds of the district, and prepare for the Department of Agriculture a list of those considered the worst.

Mr. O'Callaghan, Dairy Expert, gave a lecture on dairying, which was followed with interest by all present, and was much appreciated.

At the conclusion many questions were asked and answered.

Batlow.

At the May meeting of this branch, a very instructive paper on "Fruit-growing at Batlow" was read by Mr. H. W. Cabban. A condensation of this paper will be published in the next issue.

Blacktown.

A pruning demonstration was conducted by Mr. J. G. R. Bryant, Assistant Fruit Expert, in Mr. W. Pearce's orchard, Blacktown, on 20th May.

Mr. Pearce had placed his orchard at the disposal of the Branch, and had also promised to leave the trees as pruned for future demonstrations by departmental officers. Nine peach trees and one plum tree were pruned, and a number of questions were asked as to the cuts made, and the wood and fruit buds removed from the trees. Mr. Bryant fully explained the reasons for his methods.

Mr. Bryant, in responding to a cordial vote of thanks, reminded his hearers that pruning, though a great factor in fruit raising, was not all, as draining, manuring, &c., also required attention.

Mr. Pearce was warmly thanked for having made his orchard available.

A meeting was held at Blacktown on 1st June. The evening was occupied with general business.

Bloom Hill (O'Connell).

The following paper was read to members of this branch on 29th May, by Mr. R. Harris.

The Cultivation of Maize.

When compared with wheat, oats, barley, or rye, it will be found that maize is an expensive crop to grow, mainly owing to the fact that it does not lend itself to harvesting by machinery, and the work of pulling and husking the cobs must be done by hand. The removal of the dried stalks from the land after the crop has been harvested also involves considerable work, and the butts of the stalks are left in the ground and interfere with the preparation of the land for the succeeding crop. Taking the whole of the facts into consideration, it will be seen that a heavy yield must be obtained in order to make maize a profitable crop, and to obtain this heavy yield four things are required, namely—good land, good seed, good cultivation, and good seasons. While the majority of farmers prefer the yellow variety, I find, after repeated trials, that white maize has many good points, especially Silvermine and Boone County Special. It is recorded that the former of these two has yielded 190 bushels, and on one occasion I obtained 110 bushels per acre, but as this variety is subject to smut I have rejected it, and am growing Boone County Special instead.

Land intended for maize should, if possible, be ploughed before winter, and left in the rough state until sowing time approaches, when it should be harrowed, again ploughed, harrowed, and rolled. It is then ready for the planter. This machine apparently drops the grains too close together, and sets out the rows in one direction only, which renders thorough cultivation impossible. If the grain be dropped by hand, sowing will be slower, but a much better result may be expected. For hand sowing, light drills or marks should be made in one direction, 3 feet apart, with an implement like the Planet Jr. hand hoe; then, with the same implement, open the main drills, 3 feet apart, and at right angles to the light drills or marks, and drop two grains at each point where the drills intersect. The rows of corn will then be in line in both directions, and when required the horse hoe can be worked between them. The Agricultural Department recommends growing single grains 18 inches apart, but I find that two grains in a hill, and the hills 3 feet apart, give better results here. Seed intended to be dropped by hand should be treated with either coal or Stockholm tar; to do this, put about 20 lb. of maize in an old tub or kerosene tin, pour about a wineglassful of tar (slightly warmed) over it, and stir with a stick for a few minutes. The seed will be coated with tar, and a few ashes can be dusted over it to prevent it from sticking to the fingers. The seed may be covered either by harrowing or by reversing the mould-boards on the wheel hoe and running it along the main drills.

Cultivation between the drills should be commenced as soon as possible, so as to keep the weeds in check and to conserve the moisture, but if the grower cannot afford the time to cultivate properly, he should at least harrow the crop when it is about 3 inches high. This should be done in the warm part of the day, otherwise the plants may snap

off near the ground. If suckers appear they should be removed before they weaken the parent plant; and if a continuance of dry weather occurs, then cultivation is the only hope. Cobs to be used for seed should be chosen in the paddock; hanging cobs are to be preferred, but those from a plant showing any purplish tints, either on stalk or husk, should be rejected, and only those with a soft white covering retained. These should be well dried and protected from mice, &c., until required.

Discussion.—In the discussion which followed, Mr. Harris stated that corn required to be acclimatised; a variety that grew well on low-lying land might not succeed so well on the hillsides, and *vice versâ*. He thought it better not to change the seed, but care should be taken in the selection of cobs for seed. He had found that greater vitality was ensured by fertilisation from other stalks, and if the tassels were pulled out of every second stalk, the silks on those so treated would have to depend for fertilisation on other stalks.

Treating with tar prevented the depredations of the cut-worm, which did so much damage when the plant was sprouting. As to prolificacy, his experience was that white maize gave a higher yield than yellow, and would grow well on ground that gave only a fair return of yellow. He had grown 110 bushels of white and 60 bushels of yellow under similar conditions. With regard to suckering, he claimed that the removal of suckers had the same beneficial effect on maize as pruning had on fruit trees. The work of removing suckers could be expeditiously performed with a long-handled cutting blade kept well sharpened.

Cardiff.

The Secretary of this branch has forwarded a copy of the balance-sheet for 1914, which showed a credit of £10 11s. 3d. after all expenses had been met.

Carlingford.

The subject of weeds of the district was discussed at a recent meeting of this branch. It was decided that the following were the twelve worst weeds:—Nut Grass, Summer Grass, Couch Grass, Paddy's Lucerne, Purple Top, Sour Grass, Sorrel, Dock, Fat Hen, Stagger Weed, Cape Weed, Blackberry.

Cattai.

A meeting of the above branch took place on 4th June.

Maize Experiments.

Reports on the maize experiments were read, but the most promising crops had been destroyed by flood. The results were as follow:—

Mr. C. Cross.—Early Yellow Dent—Lost by flood. Funk's Yellow Dent—A fine sample of maize was obtained, the earliest yet known here; well-filled cobs of good shape; owing to part of the crop being destroyed, no computation could be made. Red Hogan—A fine sample of maize, averaging 75 bushels per acre.

Mr. W. Bowd.—Funk's Yellow Dent—Planted 1¼ lb. seed; result, 6 bushels of corn.

Mr. Thomson.—Improved Yellow Dent—A very nice maize; later than that generally planted; good yield.

Mr. R. T. Miller.—Boone County Special—A really splendid sample of grain on large, well-filled, regular cobs, yielding at the rate of 75 to 80 bushels.

Mr. J. Roberts (Early Yellow Dent and Red Hogan), Mr. Marshall (Improved Yellow Dent), Mr. T. M. Mitchell (Loaming and Red Hogan), and Mr. C. Moon (Boone County Special and Hickory King), all had their farms flooded, and consequently lost the crops.

Mr. George Brown sowed his sample of Hickory King very early in the season; had a good promise of a fine crop, but the drought of the early season on the highland spoiled it, and the crop was a failure.

Mr. Greentree's seed was destroyed prior to the planting season.

The results were deemed rather disappointing, but it was felt that had farmers been fortunate enough to escape the flood, the whole would have been a success.

Collie.

The monthly meeting was held on 29th May. Most of the members were busy sowing, and in consequence the attendance was small. One new member joined the branch.

The weeds of the district will be discussed at the next meeting.

Coonabarabran.

The balance-sheet to hand from the Secretary of this branch shows a credit of £8 0s. 3d.

Coradgery.

The monthly meeting of the Coradgery branch was held at the residence of Mr. J. Clatworthy, "Beechmore," on 15th May. Although the afternoon was showery there was a very good attendance, and members were well repaid by having a very interesting paper on ensilage read by Mr. W. E. Tayler, of Adavale.

Weeds of the District.

In response to a circular from the Agricultural Department asking for a list of the weeds most troublesome to the district, the following five were considered the worst :—

(1) Iron Weed.—Grows practically only on cultivation ground. If allowed to seed will overrun the paddock. Germinates in June. Considered the worst weed in the district.

(2) Cobbler's Peg or Wild Turnip.—Grows practically only in cultivation land, and if allowed to seed will "throw out" a paddock in three years. Very troublesome at harvest. Stock eat it readily when young, and it can be got rid of by throwing the paddock out of cultivation.

(3) Star Thistle.—Grows all over cultivation and grass lands as well. Needs free use of the hoe.

(4) Wild Melon.—In summer and autumn grows freely on fallowed land, and if not checked drains all the moisture. During drought periods it has grazed a great number of sheep, but is very injurious and deadly to horses.

(5) Bathurst Burr.—Not bad in this district, but on fallow and old cultivation paddocks requires annual attention.

Mr. W. E. Tayler read the following paper on ensilage :—

Ensilage Making.

Although I am not claiming to be an expert on ensilage making, perhaps the rough particulars of a pit made and filled on Adavale in the spring of 1912 will be of interest to members. A pit was excavated with plough and scoop to the following approximate measurements, viz. :—Length, 100 feet ; width on surface, 17 feet ; width at bottom, 13 feet (leaving sides nearly perpendicular) ; depth, 8½ feet for about one-third of the length in centre ; sloping bottom at each end to allow of entrance and exit of waggons. These measurements give a capacity of, roughly, 315 cubic yards. The silage sank to 18 inches below the level of surface, and the quantity of ensilage when opened up about two months ago (having weighed a block and found it went 2 cubic yards per ton) was estimated at about 120 tons. Barley grass, self-sown oats and wheat, anything round dirty headlands, and part of an oat crop, were cut with mower, carted by waggons as soon as possible after cutting, and unloaded in the following way, viz. :—A rope was put under each load, the two ends being fastened to the back of the waggon and the double hanging loose in front. When going into the pit, a rope fastened to the double was passed over the top of the load, made fast to a post in the ground, and as the team passed through the pit the whole load was pulled off and deposited in whatever part was desired. One man levelled this out while the next load was coming. The horses and waggons constantly going over the contents of the pit supplied all the pressure required. When the pit was filled to about 3 feet above the surface, 18 inches earth was scooped over the top, with a slope from the centre to ensure perfect drainage. The pit was opened for the first time on the 10th March last, and was found to contain excellent ensilage ; there was practically no waste, and less than 1 per cent. was uneatable. Forty head of cattle have been fed on it nine weeks with practically no other feed, and their condition has improved ; also, 1,000 sheep for a week or ten days. I estimate that about 85 tons have now

been used, or let us say 30 tons for forty head of cattle for nine weeks. The cost of making the pit, carting, and all labour, plus the value of oat crop cut, was about 10s. per ton, so the forty head of cattle have been fed for nine weeks at 7s. 6d. per head, which, I venture to say, is cheap at such a time as we have experienced. But the cost is really less than this, as the pit is there for all time, and should be always worth the money it cost. Deducting its value, say £15, reduces the actual cost of the ensilage to 7s. 6d. per ton; thus the cattle would have been fed for nine weeks for about 5s. 6d. per head. Ensilage has been proved to be absolutely the best feed for lambing ewes, and when it can be made for the abovementioned price, the cost of hand-feeding is infinitesimal as compared with any other fodder procurable in drought times. Bitter experience has taught us that periods of drought are inevitable in this country, and to tide over these times of scarcity of natural feed, without ruinous loss, we must turn our attention to conservation of fodder, and to my mind there is no scheme so economical as ensilage. Made in years of plenty the outlay is comparatively small, amounting to no more than a reasonable insurance premium on the value of the stock.

A hearty vote of thanks was passed, and Mr. W. E. Tayler was heartily congratulated on the success of his enterprise.

The ensilage was said to be a perfect sample, and as illustrating the state of preservation, it was mentioned that some wild daisies taken from near the bottom of the pit, on being exposed to the air for a short time, came out in bloom as perfect as if freshly pulled from the paddock.

Coraki.

At the May meeting the discussion on the weeds of the district took place. The following were the names given as the worst in the district:—Noogoora Burr, Bathurst Burr, Shiver or Stagger Weed, Nut Grass, Blue Top, Wild Millet, Wild Bean or Needle Grass, Wild Gooseberry, Johnson Grass, and Mullumbimby Couch.

The annual meeting and election of office-bearers for the ensuing year took place on 8th June, when all retiring office-bearers were re-elected.

During the past twelve months nine monthly meetings have been held. The membership roll has increased during the year from 15 to 34.

Courangra.

On 1st May, Mr. J. G. R. Bryant, Assistant Fruit Expert, gave a demonstration of winter pruning at the orchards of Messrs. S. Warland (Courangra) and A. H. Woodbury (Spencer). A commencement was made at Mr. Warland's orchard, and special attention was paid to early peaches, a class of trees with which Mr. Warland is specialising. The varieties treated included Sneed, Le Vainquer, Briggs' Red May, High's Early Canada, Wiggins', Foster, Carmen, Hay's Mid-season, Mayflower, and Elberta. Mr. Bryant also paid attention to apples and China pears.

At Mr. Woodbury's orchard, Mr. Bryant treated trees that he had pruned the previous winter and again in the summer. Of peaches, the chief varieties were Hale's Early, Wiggins', Foster, and Crawford, and apples, Trivett, Carpenter, and Jonathan, while quinces and persimmons also claimed some attention.

Both demonstrations were of an educational and instructive nature, and were much appreciated by the gentlemen present.

At a meeting on 20th May a paper on "Soil Fertility" was read by Mr. S. Warland.

Cundumbul and Eurimbla.

Following the reading of a paper by the Secretary on the weeds of the district, at a meeting on 31st May, a discussion took place, and members decided that the following four were the worst weeds of the district:—White Weed, Black Burr or Thistle, Bathurst Burr, Yellow Pea or Sweet Pea. The last-named is a shrub or pea which grows about 2 or 3 feet high, has a yellow flower, and is not eaten by stock of any kind. The following were also considered bad weeds in the district:—Australian Star Thistle, Black Oats, Mexican or New Zealand Poppy, Paddy Melon, Bindei, Roley Poley, Wild Mustard, Cobblers' Peg, Fat Hen.

Fairfield.

The annual meeting of this branch was held on 10th June; there was a very fair attendance considering the state of the weather. The Secretary reported that during the year twelve meetings had been held, at which some very valuable discussions had taken place on poultry, grafting, and grape-growing. A party of twenty of the members had visited Hawkesbury Agricultural College, and were much impressed by the courteous manner in which they were treated while there.

The following office-bearers were elected for the ensuing year:—Chairman, Mr. C. L. Oakes; Vice-Chairmen, Messrs. Hoddinett, Stutchbury, and Hamilton; Treasurer, Mr. W. Stimson; Hon. Secretary, Mr. H. P. Godfrey; Assistant Secretary, Mr. J. A. Spango.

Hay.

A discussion took place at the May meeting as regards the crop considered the most suitable for obtaining a maximum yield of cream and milk from cows. Members were of the opinion that lucerne is the best for this purpose; but where it could not be grown, a division of opinion was prevalent as to whether maize or sorghum was the better, some preferring the former, and others the latter.

The feeding of horses was also discussed.

Katoomba.

The pruning demonstration given at Katoomba by Mr. J. G. R. Bryant, Assistant Fruit Expert, on 26th May, was successfully carried out, under favourable weather conditions. The demonstrator operated on apple, pear, quince, plum, and peach trees.

Considerable information was imparted regarding the symmetry and formation of young trees, varieties suitable for interpollination, formulæ for sprays, and methods of applying them. Orchardists were advised to use red oil emulsion during the winter for combating woolly aphis and scale insects, and lime-sulphur when the buds commenced to swell. The two sprays—lime-sulphur and arsenate of lead—combined, were recommended for the

codlin moth and black spot. The combined spray should be applied at the time the flower petals were falling, as clean fruit was then ensured.

Mr. A. M. Makinson, the officer appointed to organise the branches of the Agricultural Bureau, addressed a few encouraging remarks to the members.

A vote of thanks was accorded to both officers.

Kellyville.

The monthly meeting of this branch was held on 5th June, the Chairman, presiding. The Secretary reported that Mr. A. M. Makinson, organiser of the branches, had paid a visit recently. Mr. Makinson had suggested that the branch should have a general exhibit at the next Castle Hill show, and the meeting decided to adopt the suggestion. The Secretary then reported that he had received the subscriptions of four new members, and that a total of forty-five members had paid their subscriptions.

The business for the evening was a discussion on the weeds of the district.

Mr. H. Reid opened the discussion, ably dealing with the weeds that were a menace to the fruit-growers, and also those that he thought were beneficial to the soil as manure. He illustrated his remarks with numerous specimens he had collected.

Mr. J. Armstrong gave his opinion on the weeds which he thought were the most serious pests. His opinion was, that if the fruit-grower could work his ground at the right time, there would be very little trouble. Unfortunately, the grower had not time to eradicate weeds and pull fruit too.

Mr. H. Firth pointed out that farmers of the district should try to eradicate Spear Grass, as it was dangerous to horses, and was beginning to spread in the district.

Mr. J. Nutter gave his experience with Nut Grass and Fat Hen. He thought the seeds came first in the stable manure, and if the towns were cleared of all the worst weeds, growers would not have so many. There were allotments of land and back lanes in some towns that were full of these weeds.

Leech's Gully.

A fair number of members attended the May meeting of this branch. Mr. A. Mansfield, Chairman, presided.

This branch, in conjunction with the local Boy's Corn Club, offered three prizes of £4, £2, and £1 for the most profitable plots of maize one square chain in area, to be competed for by boys who were members of the Corn Club.

Appended is a copy of the report of the Secretary of the Corn Club, Mr. R. L. Walker, on the result of the competition:—

BOY'S CORN CLUB COMPETITION.

In conjunction with the President, I inspected and ascertained the yields of corn in the Boy's Corn Club Competition on 5th May. Originally there were six boys in the competition, but, owing to the dry weather, two dropped out, leaving only four. The yields obtained by these four lads, in spite of the dry season, are very satisfactory indeed, and go to show that dry seasons can be overcome to a great extent by thorough cultivation.

The average yield from the four plots was 45 bushels per acre. With maize at the present price, what sort of a cheque would individual farmers have received this year if their yield had been anywhere near 45 bushels per acre? The boys took great care of

their plots, and were very interested in the work. It is a matter for disappointment that more did not enter and make the contest even more interesting. We all know what a high standard these competitions have reached in America, and why could not the same be attained here?

White corn easily secured top place as for yield with 54 bushels 16 lb. per acre. This was grown by Master Bruce Wilkie in virgin land. The other lads all had good results, and it is to be hoped that if there is another competition they will do better still.

The results, in order of yield, are as follow :—

(1.)	Master Wilkie	...	54 bushels	16 lb.	per acre.
(2.)	,, Campbell	...	47 ,,	28	,,
(3.)	,, Nolan	...	45 ,,	0	,,
(4.)	,, Penson	...	35 ,,	3	,,

Each boy made out a report on his crop. As to the cost, two boys allowed for rent—one 5s., and the other 2s. 6d.—but they did not say whether it was for a square chain or for an acre.

Leeton.

The usual monthly meeting was held on 28th May.

A communication was read from Mr. H. R. Alexander of the Water Conservation and Irrigation Commission, to the effect that he would arrange to give a lecture on pig-raising at a later date.

Mr. A. V. Roux was elected Hon. Secretary, *vice* Mr. C. Ledwidge, resigned.

A meeting of this branch was held on 11th June. Ordinary business was dealt with, and then Mr. M. A. O'Callaghan, Dairy Expert, gave an interesting lecture on dairying. He dealt with the handling of milk, suitable fodder crops, size of blocks suitable for dairy farms, separating, and the butter markets of the world.

Three new members were enrolled.

Miller's Forest.

The May meeting of this branch was held on 18th May, when the Chairman, Mr. James Priddle, presided.

The samples of cereals received from the Department were inspected by members, who expressed satisfaction with the excellence of the samples.

It was decided to call a special meeting of the members for the purpose of getting an expression of opinion of the twelve worst weeds in the district.

The Secretary then submitted a report of the maize which had been harvested by him. The seed was received from the Department, and grown on Mr. John O'Brien's property. When fit for husking and threshing, a report will be sent to the Department.

Mittagong.

The winter pruning demonstration arranged to take place at No. 8 Farm Home Orchard on 8th June, proved very successful. The demonstrator, Mr. J. G. R. Bryant, Assistant Fruit Expert, tendered good advice on spraying fruit-trees, and on fruit-growing in general.

At the conclusion of the demonstration, the regular monthly meeting was held, at which the ordinary business of the branch was dealt with, and a vote of thanks was passed to Mr. Bryant for his services.

Narrandera.

The ordinary monthly meeting of this branch was held at the Mechanics' Institute on 29th May.

The Secretary reported that the funds were in credit to the amount of £2 8s.

The Department's letter, asking to be supplied with a list of the worst weeds growing in this district, was considered.

It was decided to forward the names of the following weeds as being the worst growing here:—Star or Saffron Thistle, Castor Oil, Bathurst Burr, Stinging Nettle, Bindei, Cockspur, Prickly Lettuce, Hogweed, Sodom Apple, Field and Marsh Mallow, Chickweed, Wild Mustard, Cobbler's Peg, and Caltrop.

A large parcel of samples of sheaves and grain, forwarded by the Department of Agriculture, was opened for the inspection of members. There were sheaves of twenty-three varieties of wheat, six varieties of barley, twelve of oats, and two of rye. The samples of grain consisted of almost every class and variety of grain that can be grown in this district.

It was decided to procure a glass-fronted case for the purpose of preserving the collection.

The President suggested that in order to make their meetings more instructive they should draw a plan of a model farm, and read papers and have discussions on each department until every section had been discussed.

The suggestion was warmly approved, and it was decided that the farm be "developed" until it became a model holding consisting of 640 acres selected from the Crown at 30s. per acre; the land to be virgin country, with an average amount of timber and the usual number of rabbits to be found on Crown lands; the land is to be improved up to £5 per acre; the selector to start with plant and capital to the value of £1 per acre of the area of the holding.

The President and Secretary were asked to draw up a plan of the farm and submit same at the next meeting of the Bureau; and at a future meeting the members will proceed to discuss the fencing and the utilisation of the timber on same.

Mr. Hopwood promised to lead a discussion at next meeting on the subject of the preparation of the soil for wheat-growing.

Nimbin.

This branch held its monthly meeting on 29th May, when there was a good attendance.

There was a discussion on artichokes and sweet potatoes, the latter being considered the best to grow here. Some contended that poor land was best for sweet potatoes, whilst others stated that they had dug large crops from good alluvial (rich) flats.

One member said that perhaps some of the failures on rich land were due to the lack of some necessary plant food. The best method was to plant cuttings in high hills and keep them clean until they were well established.

It was also stated that a serious disease (curly top) had broken out amongst sweet potatoes in the Big Scrub country, and it threatened to destroy them completely. Hopes were expressed that it would not spread to Nimbin, as sweet potatoes were such a useful crop and cheap to grow.

A helpful discussion took place on burning out stumps (stoving), by digging round the trunks about 12 to 14 inches deep and starting a fire, and then banking up with sods to keep heat in. Some members reported good results.

Pyangle (Lue).

A branch has been formed in this district, to be called the Pyangle branch. The following office-bearers have been elected:—Chairman, Mr. W. J. Clarke; Vice-Chairman, Mr. John J. Batten; Treasurer, Mr. Edward Batten; Hon. Secretary, Mr. T. A. Sheridan.

The annual subscription fee was fixed at 2s. 6d. per member, and the regular monthly meeting is to be held at the Pyangle school at 2 p.m. on the first Saturday each month.

There are twenty-six members to commence with, which should form a strong branch.

At the meeting on 5th June, a short discussion took place as to the best methods of poisoning starlings, which are proving a serious pest to wheat growers in the locality.

Robert's Creek.

At last meeting of this branch members agreed that the following were the worst weeds in the district:—Nut Grass, Prickly Pear, Noogoora Burr, Bathurst Burr, Convolvulus, Scotch Thistle, Johnson Grass, Summer Grass, Cape Weed, Carrot Weed, Shiver Weed, and Rushes.

A discussion took place on the loss occasioned farmers by the prevalence of different weeds, and on the methods of eradication practised by local farmers. It was resolved that the Secretary forward in writing to the Under Secretary the views of the branch in regard to weeds, making special mention of Nut Grass and the efforts of local farmers to cope with the pest.

It was agreed that application be made for a lecture by Mr. O'Callaghan on the working of milking machines and scientific dairying, and that Mr. G. Marks be asked to continue his lectures on pigs and their management.

It was also decided to ask the Under Secretary to arrange a competition at the Royal Show among the branches of the Agricultural Bureau.

The Secretary reported on the visit of Mr. A. M. Makinson, and his remarks on the desirability of further increasing the membership.

St. John's Park.

At the meeting held on 15th May, the following office bearers were elected for the ensuing year:—Chairman, Mr. A. Ollis; Vice-Chairmen, Messrs. F. Gava and E. Buckland; Treasurer, Mr. T. Hunt; Hon. Secretary, Mr. J. C. Scott.

Stockinbingal.

The Secretary reports that a successful meeting of this branch was held on 22nd May, although the weather conditions were not at all favourable. The attendance numbered twenty-six.

An election of officers took place, resulting as follows:—Chairman, Mr. B. Witenden; Vice-Chairman, Mr. A. Gilmour; Hon. Secretary and Treasurer, Mr. J. Neville.

Subjects decided upon for discussion at the next meeting are "Lamb Marking," and "Working of the Soil after Sowing."

Mr. Neville anticipates being able to work this into a very strong branch, as local farmers appear to be taking more interest in the movement than they have in the past.

Tallawang.

The monthly meeting of the above branch was held on 29th May, when the subject for consideration of the members was colic in horses. An article on the subject was read from a standard work, and a discussion followed that should prove helpful to members.

Tatham.

The monthly meeting was held on 31st May, Mr. M. F. Nolan, presiding over a fair attendance of members.

The Department wrote asking for information about the weeds in the locality, and members suggested Nut Grass and Johnson Grass as the two worst; they thought it was impossible to eradicate either of them. Summer Grass, Stinking Roger, Paddy's Lucerne, Convolvulus, Mignonette, and Shiver Weed could be dealt with by thorough cultivation and a rotation of crops. Lantana and Scotch Thistle gave a lot of trouble on the rivers. The only way to get rid of Lantana was to brush the top growth, and grub out the roots. It was considered useless to touch Scotch Thistle. Dock had to be dug up and carted off the field.

Noogoora Burr was hard to eradicate, as the seed or burrs clung to horses and cattle, and freshets distributed it along the river banks, making it a menace to low-lying land. Owners were advised not to let a single plant shed its seed. Paspalum and Blue Couch often proved troublesome in cultivation land and had ruined lucerne beds.

Uralla.

A demonstration of winter pruning was conducted by Mr. W. Le Gay Brereton, Orchardist of Glen Innes Experiment Farm, at Mr. E. A. Neil's orchard, "Pomona," Uralla, on 10th June. Unfavourable weather prevented a large attendance, snow having fallen heavily during the previous night and still being thick on the ground.

A demonstration was also given at Methven Park on the afternoon of the same day, when the attendance was about twenty.

Keen interest was evinced in the work done by Mr. Brereton.

Orchard Notes.

W. J. ALLEN.

JULY.

Planting.

GOOD rains fell during the past month in most fruit districts of the State. Planting, therefore, should be carried on without delay. Deciduous fruit trees should not be planted too late in the season; the end of the present month should see the planting over in most districts. Of course in districts such as Armidale, Orange, and Batlow, planting in August may be carried on, although it is somewhat late for the work.

Each species of tree should have varieties so placed that the blossoming habits coincide; for this reason, two rows of one variety are considered quite far enough apart for any direct benefit from cross pollination.

Refills should be planted in the deciduous fruit orchard. In planting young trees care should be taken to remove damaged roots, and to give the root system plenty of space when setting in the hole. The roots should be spread evenly around the hole, the strongest roots if possible pointing to the west or south-west. In light soils the trees may be set deeper than in heavy lands, although a reasonable depth is the union where the trees are worked. In case of doubt the depth at which the trees were planted in the nursery is suitable.

Remember when planting out that trees live from twenty-five to fifty years under suitable conditions, so that no amount of care in preparation of land and planting should be considered wasted. Each species of tree requires to have as near as possible the soil it likes best, and be set out in a position in the orchard where wind, frost, and drainage have been considered. In other words, such trees as quince, pear, and plum stand much more hardship from the above point of view than peach, apricot, and cherry.

Pruning.

This must be pushed on as fast as possible so that it will be completed and the ground well ploughed while it is still moist. Each and every tree has its own individuality, and therefore the grower should study the habits of the different trees, and prune them in such ways as will ensure that they will return him the best fruit from year to year. Weak trees may have their leaders well shortened back. (See book on "Pruning," issued by the Department, which is obtainable from the Government Printer at 1s.) Burn all prunings as soon as possible. The most expeditious way to accomplish this is to mount an old tank on wheels with a grating in the bottom.

While pruning or working around the trees, always keep a sharp look-out for any diseases which are liable to attack them, and mark any trees so affected.

Grafting and Budding.

Towards the end of this month, on the coast and warmer districts, and early next month for the tablelands, grafting work may be carried on. The scions should be secured from bearing trees of the varieties required. The scions should be laid in nice, warm, moist soil, so that they may be perfectly dormant, yet fresh, when grafting. Stone fruits are not always so successfully grafted as pome fruits. To save disappointment, stone fruits should be cut off to three or four branches, about a foot to 18 inches long, and budded on the ensuing young growth during February and March. If it is desired to bud in the spring, scions with well developed buds may be taken this month and placed in cool storage. Only wood from well-known bearing trees should be used. The buds may be taken from the cool room in the early growing months of spring, and inserted in the stocks.

Early Ploughing Necessary.

In the drier, warmer districts, and in light shallow soils, ploughing operations should be carried out without delay. The present appearance of the trees points to heavy bloom, and for this reason the conservation of the soil moisture must not be neglected. Year after year one finds many growers who have been unfortunate enough to neglect early working of the soil with the result that the ground has had to be worked when dry and out of condition. Conservation of soil moisture is the limiting factor in the production of good fruit in many orchard districts, hence the need for early working.

Care in Ploughing.

It is quite a common sight in young orchards to find trees very badly scraped, and the bark torn and broken. With apples this carelessness has been the means of woolly aphis securing a hold. Orchardists must be determined to avoid damaging young trees. Careless driving, the use of chain traces, and endeavouring to work too closely to the trees are the causes. Ploughs with movable handles and wide racks should be used, together with special orchard harness with narrow swingle trees. High iron hames should be avoided amongst bearing trees.

Cleaning Stems.

Loose rough bark should be scraped from apple, pear, and quince trees, as under the bark may be found cocoons of the codlin moth. Borers should also be sought out. They are readily detected by the sawdust like markings on the stem and main branches. Probing, with a strong piece of wire, the tunnels where they are working will usually dislodge them. Soap or grafting wax placed in the tunnel will assist the wound in healing.

Rough bark should be removed from grape vines, so that they may be easily treated with spray for *Anthracnose* (Black Spot). The vine posts should be searched for the small chocolate-coloured cocoons of the vine moth.

Spraying.

No delay should be tolerated in connection with early spraying. Last season black spot and brown fruit rot caused considerable loss. As soon as the blossoms show colour (pink), either lime-sulphur or Bordeaux mixture, winter strength, should be applied. In the case of scale insects and woolly aphis, also peach aphis, either lime-sulphur or miscible red oil may be used. Lime-sulphur will not kill aphis, so that the red oils must be used. The miscible red oils in the market are proving of great value to the orchardist. Only use brands that have been proved to be effective.

Harvesting.

Citrus fruits will require to be harvested. The greatest care should be taken in picking, as the slightest bruising, although not apparent at the time, may cause decay in transit. The fruit should be carefully graded and packed to ensure high prices. For this purpose packing the fruit in diagonal rows in the cases enables the grower to pack up to grade, without which the packing will not be first-class.

Almonds in New South Wales.

In reply to a correspondent from Ulladulla, the Fruit Branch of the Department supplied the following :—

There is undoubtedly room for extension in the culture of almonds in this State. Almonds have proved to be suitable in dry inland districts, but have not been extensively planted on the coast. Where trees have been planted in the coastal districts, they have grown well, and have not been subject to pests. One difficulty, however, has been that the crops have not proved remunerative. This lack of cropping has no doubt been due to the fact that only one variety has been planted, whereas in planting almonds it is most essential for the purpose of interpollination to plant at least four or five varieties.

In the Government orchard at Dural, which is about 15 miles from the coast, almond trees have been planted on suitable soil, in a situation free from frost, and have proved very suitable to the district.

It should be remembered that almonds require a medium to sandy loam soil, and planted in a situation where there is no danger from late frosts, as they are particularly susceptible to this on account of their early blossoming habits. The following varieties are recommended :—Golden State, Riverside Peerless, Paper Shell, Hatch's Nonpareil, and Brand's Jordan.

The almond tree is not generally subject to damage from birds or from pests.

Apiary Notes.

July.

R. G. WARRY, Demonstrator in Apiculture.

DURING the latter part of this month and in August, colonies of bees show signs that mid-winter has past, but in the colder parts bees will still be practically inactive. In the latter localities, the opportunity this gives of making thorough preparation for the forthcoming season should not be missed. The past season for honey has been disheartening throughout the State, and just now beekeepers find themselves with a quantity of vacant hives and their fittings on hand, which had been occupied by colonies of bees before they were starved out in the drought. All this material should be cleaned and made ready for use. Much of the comb in frames, if it has been properly cared for and kept free from moths, will be fit to be utilised again; uneven combs and those with large patches of drone cells should be sorted out, melted, and put through the wax press. The wax obtained can be sent to the factory to be made up into comb foundation. The experience many beekeepers have had during last season is hardly likely to lead them to prepare for much increase in the apiary during the coming season; but in spite of the poor honey crops of the past year, preparation should always be made during the winter months for dealing with something more than the buds on trees and the general conditions of the bush indicated for the next spring flow of honey. Many of our apiaries have been built up gradually by buying colonies of bees and material from several different apiaries, the result being that the material in them is not interchangeable throughout; this is a drawback, and when sorting out hives and frames one pattern of hive should be decided upon, and all material of this pattern, or which can be altered to suit it, should be attended to and used first; whereas the rest should only be used when the other is exhausted, or, better still, disposed of and replaced by material of the right pattern.

In the warmer districts, colonies will be active and brood-rearing increasing towards the end of this month. This is always a temptation to expand the brood nest by inserting an empty comb in the centre of it, with a view to getting the queen to lay faster and produce a strong colony earlier than would have been possible if the colony had been left to increase its brood nest as it was inclined. Expanding the brood nest at this time of the year, and, inded, until the end of August, is risky; it should not be attempted until winter is quite past, as a few cold and wet days following a week or so of warm weather will do considerable harm to a colony if the bees have an excess of brood to cover, or if their brood combs are divided by an empty comb.

Government Stud Bulls available for service at State Farms, or for lease.

Breed.	Name of Bull.	Sire.	Dam.	Stationed at—	Engaged up till—
Shorthorn ...	Melba's Emblem (Vol. IV. M.S.H.B.)	Emblem of Darbalara (100 M.S.H.B.)	Melba 3rd of Darbalara (1058 M.S.H.B.)	Berry Farm ...	‖
" ...	Imperialist ... (183 M.S.H.B.)	Florio	Lady Nancy of Minembah.	Berry Farm ...	*
Jersey ...	Grenadin (imp.)	Attorney (9477)	Cyril's Carnation (imp.).	Yanco Farm ...	*
" ...	Trafalgar ...	Best Man ...	Rum Omelette	Cowra Farm ...	*
" ...	Kaid of Khartoum	Sir Jack ...	Egyptian Belle	H. A. College ...	*
" ...	Leda's Retford Pride.	Dinah's Lad ...	Leda's Angel..	Wagga Farm ...	‖
" ...	Goddington Noble XV (imp.)	Goddington Noble	La Franchise 3rd.	" ...	*
Guernsey ...	The King's Mirror	Calm Prince ...	Vivid (imp.)...	Woodburn ...	19 Oct., '15.
" ...	Star Prince ...	Calm Prince ...	Vivid (imp.)...	Murwillumbah ...	20 Oct., '15.
" ...	Godolphin Moses (imp.)	Golden Hero of the Vauxbelets (1929)	Rosetta (6509)	Wollongbar Farm	*
" ...	Hayes' Fido (imp.).	Hayes' Coronation 3rd.	Hayes' Fi-Fi 2nd.	Wollongbar ...	30 Nov., '15
" ...	Claudius (imp.)	Golden Star II..	Claudia's Pride (imp.).	Murwillumbah ...	30 Dec., '15.
" ...	George III ...	King of the Roses	Calm 2nd ...	Wollongbar Farm	‖
" ...	The Peacemaker	Calm Prince ...	Rose Petersen	Wollongbar Farm	‖
" ...	King of the Roses	Hayes' King ...	Rosey 8th (imp.).	South Kyogle ...	30 July, '15.
" ...	Lauderlad ...	Laura's Boy ...	Souvenir of Wollongbar	Mullumbimby ...	6 Oct., '15.
" ...	Belfast	King of the Roses	Flaxy 2nd ...	Tyalgum	28 May, '15.
" ...	Royal Preel ...	Itchen Royal ...	Hayes' Lily du Preel (imp.).	Murwillumbah ...	30 Aug., '15.
" ...	Alexander the Great.	Claudius (imp.)	Alexandrina of Richmond.	Warneton ...	27 Sept., '15.
Ayrshire ...	Wyllieland Bright Lad (imp.)	Wyllieland Gleniffer (7229)	Wyllieland Sangie	Glen Innes Farm..	*
" ...	Isabel's Majestic	Majestic of Oakbank.	Isabel of Gleneira.	Grafton Farm ...	‖
" ...	Lessnessnock (imp.) (500 A.H.B. of A.)	Marshal Oyama (5841 A.H.B. of S)	Bloomer B. of Lessnessnock.	" ...	‖
Holstein ...	Sultan La Polka (imp. N.Z.)	King of Dominos (297 N.Z.H. & F.H.B.)	Princess La Polka (292 N.Z.H. and F.H.B.)	Berry Farm ...	*
Kerry... ...	Castle Lough Ranger (imp.)	Waterville Rover	Castle Lough Lizzie.	Bathurst Farm ...	*

*Available for service only at the Farm where stationed. † Available for lease or for service at the Farm where stationed.
‖ Available for special service where stationed upon application to the Under Secretary.

BULLS FOR SALE

AT HAWKESBURY AGRICULTURAL COLLEGE.

RED POLL.—Belmont Ajax (No. $\frac{1}{62}$): calved 7th January, 1912; colour, red; sire, Acton Ajax (imp.) (9,655); dam, Shamrock, by Magician, (imp.) (5,021); from Spinster, by Laureate (imp.) (1,563) from Spot (imp.) (5,136 R.P.H.B.). Price, **30 guineas.**

AT BERRY EXPERIMENT FARM.

MILKING SHORTHORNS.—The Irishman (imp.) (495): date of birth, 12th August, 1911; colour, red, very little white; sire, Tipperary Bull; dam, Colleen Bawn (imp.), (1333 M.S.H.B.). Price, **40 guineas.**

Milk yield of dam :—	Milk lb.	Fat per cent.	Butter lb.
Colleen Bawn	6,937	3·8	309

Prince of Temora; date of birth, 1st March, 1914; colour, roan; sire, Cameo of Darbalara, (154 vol. iii, M.S.H.B.); dam, Primrose VIII. of Darbalara (passed vol. iv., M.S.H.B.), by Emblem of Darbalara (100 M.S.H.B.) from Primrose of Bolaro, (568 vol. i, M.S.H.B.). Price, **15 guineas.**

No record of dam. Calf allowed to suckle.

Imperial Favour (653); date of birth, 19th May, 1914; colour, rich roan; sire, Imperialist (183 M.S.H.B.); dam, Mooki Favour (1604 M.S.H.B.), by Royal Duke 2nd (imp.) from Mooki Rose (487 M.S.H.B.). Price, **18 guineas.**

	Milk lb.	Fat per cent.	Butter lb.
Milk yield of dam (incomplete)	5,671	4·0	266·70

JERSEYS.—Wagga Aeronaut (315); calved 20th March, 1914; colour, whole fawn; sire, Grenadier (imp.); dam, Wagga Aitua (787 A.J.H.B.). Price, **12 guineas.**

Wagga Commander (319): calved 10th June, 1914; colour, whole fawn; sire, Aitua's Lad; dam, Wagga Clover (781 A.J.H.B.); Aitua's Lad, by Kaid of Khartoum, from Wagga Aitua (787); Kaid of Khartoum, by Sir Jack from Egyptian Belle (382); by Tidy Punch, from Egyptian Princess (imp.) (65 A.J.H.B.). Price, **12 guineas.**

GEORGE VALDER,
Under Secretary and Director of Agriculture.

AGRICULTURAL SOCIETIES' SHOWS.

SECRETARIES are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 21st of the month previous to issue. Alteration of dates should be notified at once.

1915.

Society.	Secretary.	Date.
Peak Hill P., A., and H. Association	A. Yeo	July 28, 29
National A. and I. Assn. of Queensland (Brisbane)	J. Bain	Aug. 9–14
Narandera P. and A. Association	H. S. Robinson	,, 10, 11
Trundle P. and A. Association	W. E. Herborn	,, 10, 11
Corowa P., A., and H. Society	J. D. Fraser	,, 16, 18
Murrumbidgee P. and A. Association (Wagga)	A. F. D. White	,, 24, 25, 26
Parkes P., A., and H. Association	G. W. Seaborn	,, 25, 26
Ariah Park P., A., H., and I. Association	J. E. Rowston	,, 31, Sept. 1
Germanton P., A., and H. Society	J. S. Stewart	,, 31, ,, 1
Grenfell P., A., and H. Association	G. Cousins	,, 31, ,, 1
Narrabri P., A., and H. Society	D. J. Bridge	,, 31, Sept. 1, 2
Albury and Border P., A., and H. Society	W. I. Johnson	Sept. 7, 8, 9
Young P. and A. Association	T. A. Tester	,, 7, 8, 9
Cowra P., A., and H. Association	E. W. Warren	,, 14, 15
Cootamundra A., P., H., and I. Association	T. Williams	,, 14, 15
Canowindra P., A., and H. Association	G. Newman	,, 21, 22
Temora P., A., H., and I. Association	A. D. Ness	,, 21, 22, 23
Northern A. Association (Singleton)	J. McLachlan	,, 22, 23, 24
Murrumburrah P., A., and I. Association	J. A. Foley	,, 28, 29
Yass P. and A. Association	E. A. Hickey	,, 29, 30
Tweed River A. Society (Murwillumbah)	A. E. Budd	Nov. 10, 11

1916.

Society.	Secretary.	Date.
Wollongong A., H., and I. Association	W. J. Cochrane	Jan. 13, 14, 15
Kiama Agricultural Society	G. A. Somerville	,, 26, 27
Inverell P. and A. Association	J. McIlveen	Feb. 22, 23, 24
Southern New England P. and A. Association (Uralla)	H. W. Vincent	,, 29, Mar. 1
Tenterfield P., A., and M. Society	F. W. Hoskin	Mar. 7, 8, 9
Crookwell A., P., and H. Society	M. P. Levy	,, 9, 10
Nepean District A., H., and I. Society	P. J. Smith	,, 10, 11
Central New England P. & A. Association (Glen Innes)	G. A. Priest	,, 14, 15, 16
Manning River A. and H. Association	L. Plummer	,, 15, 16
Camden A., H., and I. Society	A. E. Baldock	,, 15, 16, 17
Armidale and New England P., A., and H. Assoc'n.	A. McArthur	,, 21, 22, 23, 24
Quirindi District P., A., and H. Association	C. G. Brandis	April 4, 5, 6
Cooma P. and A. Association	C. J. Walmsley	,, 12, 13
Upper Hunter P. and A. Association (Muswellbrook)	R. C. Sawkins	,, 12, 13, 14

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Agricultural Gazette of New South Wales.

Wheat-breeding in New South Wales.

[Continued from page 567.]

J. T. PRIDHAM, Plant Breeder.

Heredity.

HEREDITY is the transmission of distinguishing qualities from parent to offspring. These qualities may be thought of according to Mendel's theory of inheritance as separate units.

Gregor Mendel explained his theory to the Naturalists' Society of Brunn in 1865; but the paper was lost sight of until 1900, when it was discovered and its value appreciated by De Vries, Correns, and Tschermak. Mendel's observations were made with peas, but the principles hold good for wheat and other plants. He did not view the crop in a general way, but compared individuals, character by character, in a statistical examination, and concluded that the gametes—egg-cells and pollen grains—are pure with respect to the characters they bear. If a cross is made between a bald and a bearded wheat, the crossbred produces gametes which carry either the bald or the bearded character, not a blend of the two.

Mendel calls the character which appears in the crossbred to the exclusion of the opposite one a "dominant character," and the latent one "recessive." Many pairs of differentiating characters, however, are not sharply dominant or recessive. The bald is found to be dominant to the bearded character in wheat. The grain resulting from the cross produces plants which are either bearded or bald in the second generation, and, on counting, the proportion is seen to be 3 D to 1 R. The "dominant" plants look alike, but in the third generation only one-third of them reproduce the bald character in a pure state, the other two-thirds consisting of both bald and bearded plants, while the "recessives" breed true. The third generation may be set down as D—2 DR—R; or out of 100 plants there will be twenty-five pure dominants, fifty similar to the crossbred, as they give the same types of offspring in the same proportion and twenty-five pure recessives. The pure dominants and recessives (D and R), when isolated, breed true indefinitely. Professor Biffen, of Cambridge, explains it in this way: "The two kinds of gametes of the crossbred bear either the bald or the bearded character, D or R. If these are produced in approximately equal numbers, then, when fertilisation occurs, the chances are that a D pollen grain may meet a D or an R egg-cell, giving rise to an embryo with either D characters or only an hybrid DR. Similarly an R pollen grain may give rise to R or DR embryos according as to its mating with an R or D egg-cell. An RD plant will produce the D—2 DR—R ratio in its offspring."

This affords the simplest possible case where one pair of characters only is concerned. As a matter of fact, there are a great many differing pairs of units involved in the crossing of two different varieties of wheat, such as colour and holding qualities of the chaff, colour, shape, and hardness of the grain, tallness, strength, and texture of the straw, &c. The great value of Mendel's laws of inheritance is that any desired character or combination of characters may be secured in a crossbred in the second or third generation, if all the progeny of the cross are sown. Dr. H. Nilsson-Ehle, of Svalöf, in Sweden, says, in the *Bulletin of Agricultural Intelligence*, June, 1913: "Most of the practically important characters are exceedingly complex, such as winter hardness, early maturity, rust resistance, resistance to lodging, productivity, size of grain. After crossing two constant forms or lines which represent two degrees of a character, *e.g.*, height of plant, the segregation is always complicated, and can only be ascertained by the separate cultivation of all the second generation plants, and by the comparison of the average characters of their offspring in the third generation. Crosses between any two tall and short constant lines do not give (or only in the rarest cases) the simple Mendelian segregation. We do not get one-quarter tall, one-half tall-short, and a quarter short, but a whole series of gradations, among which those of the parents are very rare or may be completely wanting, so that the whole segregation is intermediate, and does not attain to the limits given by the parents.

A selection from Federation wheat, which had soft opaque grain, was crossed by the writer in 1910, with Comeback, the grain of which is hard and translucent. The crossed seeds were sown, and their grain produced in the third generation some 60 plants, not one of which was found to have the translucent grain of the Comeback parent. Again, Federation was crossed with Rieti, which is a late-maturing variety with us, and is noted for its rust-resistance in Italy. From the numerous selections made, none matured sufficiently early to be useful for our climatic conditions; all were later than the Federation parent. It is quite possible had a larger number of plants been grown that the desired character would have appeared.

It is evident that very large numbers of plants must be grown and examined; and when the individuals conforming to the required type are found, they must be planted separately to see whether they will breed true. Productiveness—the main issue with the farmer—does not conform to simple Mendelian ratios, as it is an exceedingly complex character, depending upon a number of other factors; pedigree culture alone will reveal a productive strain.

We have an instance of the successful combination of desired characters in Federation, a variety combining the grain-producing qualities of Purple Straw with the good holding capacity, short straw and early maturity, of its Fife-Indian parent. And Firbank combines the haymaking qualities of the one parent—Zealand—with the early maturity of the other, Maffra.

The most important factor in breeding is that of prepotency or transmitting power. A breeder is working on right principles with wheat if he uses

pedigreed lines or strains instead of mixed cultures, and selects continuously the plants which are most prepotent for the special characters he needs. It may be well (with Shamel of America) to distinguish between a plant-breeder who, by considerable experience with a crop from a grower's standpoint, becomes a judge of its value for economic cultivation, and a scientific investigator who works out facts from the theories of Mendel and others for the breeders' guidance.

Variation.

"Fluctuating variations" are so called because they fluctuate about a mean or follow a linear scale. The height and yield of the plant, and even its outward appearance, are modified by favourable or unfavourable conditions of soil and climate; but such variations do not persist from year to year. The farmer is sometimes deceived by this type of variation when he saves for seed a patch of wheat which, as the result of more favourable local conditions, has shown exceptional vigour. Such seed will grow a crop only approximating the average yield of the variety. Similarly, an individual plant may be found with an unusual number of stems, and of striking appearance, but in most cases separate culture will show no superiority to the average.

"Discontinuous" Variations.

Sometimes, however—and it is worth while growing such striking individuals—a useful and productive variety may result. Steinwedel and Dart's Imperial are instances of this; and instead of reverting to the mean of the variety, these variations breed true to the initial choice, and are called "discontinuous" variations or "sports." The only way to distinguish between a fluctuating and a discontinuous variation is to grow the progeny of such a plant alongside the crop from which it was taken and note whether its distinguishing characters are prepotent or revert to the general type of the parent crop. We have grown plants of malting barley, which were only partially awned, in the hope of breeding a bald type, but they have reverted to the fully awned form. Sunrise oats originated with a discontinuous variation found in a plot of Algerian oats; it bred true to type from the first.

De Vries separates variations into two classes:—

(1) Fluctuations. (2) Mutations.

His theory is that species originate from other species by sudden leaps called mutations. There are no intermediates, each mutation breeds true, requiring no selection or improvement for its full development. Dr. Nilsson-Ehle, speaking of the breeding work at Svalöf from 1900 to 1913, says that no improved variety has been obtained by mutation. A. Howard, M.A., of Lyallpur, India, states in his book, "Wheat in India," that "no cases of undoubted true mutation have, so far, been observed in the pure line cultures. Natural cross-fertilisation, however, was proved in a large number of cases at Lyallpur." This has been our experience in New South Wales, though instances of mutation have been recorded in the case of the potato and other plants, including the historic case of the evening primrose. We

have found discontinuous variations (the "elementary species" of Nilsson) in the following wheats:—Federation, Bunyip, Firbank, Zealand, Comeback and John Brown. These present differences in colour and shape of head, as well as the economic qualities of stoutness of straw and holding capacity of chaff. The variations bred true to type when propagated, but showed no apparent superiority to the type from which they had been taken. A pure race may be derived from such plants without the long course of methodical selection once practised. The initial choice once made, nothing further is required but to multiply its progeny. Pedigree culture would be necessary to keep the type pure, but no further permanent improvement is possible by means of selection. Variants are found sometimes, which are due to natural crossing, and these continue to vary when propagated; this will be discussed when dealing with crossing.

In New South Wales we have not made much use of this method of breeding, as variations which catch the eye in a field crop are for the most part exceptionally vigorous plants, and these yield grain usually of a mediocre type, from the standpoint of flour quality. It is rare to find variation in the direction of improved quality of grain, and we have relied upon cross-breeding to cause the desired variation in this direction. Were productiveness our sole objective, the raising of improved varieties would be an easier matter. Although, broadly speaking, "like begets like" in nature, yet the supposed immobility of the species has been too much insisted upon. It is only recently that breeders have discovered the possibilities in isolating strains often similar in appearance, but in productiveness making all the difference between success and failure.

Correlations.

It was thought that useful economic characters were associated with certain outward botanical formations in the wheat plant, such as strength of straw with density of head, and yielding qualities with the number of grains per spikelet. Nilsson has shown that there are numerous exceptions, and no constant correlation can be traced in such cases. The weight of grain per plant gives a more reliable idea of the productiveness of a strain, besides being quicker and easier of determination. The prepotency of a plant becomes the final test, though a knowledge of correlations may be of some assistance. There is as much difference among plants in ability to transmit their characters as exists among the characters to be transmitted. As a guide to the selection of varieties for rust resistance, we have found this quality associated with a fleshiness and turgidity of the leaf, which is narrow, short, and of a glaucous green colour. Limp and long leaves of a pale green tint, usually denote rust liability. Shortness of straw is not always correlated with high grain yield, though Federation is an instance of this. Weakness and brittleness of straw are found in varieties that mature early, especially when such sorts are productive. Wheats which yield grain of good milling quality generally show a tendency to weak straw. It was noticed during the last three seasons at the Cowra Experiment Farm that

the straw of Hard Federation, though sufficiently strong, is weaker and rather more brittle than that of the old type of Federation. Its grain also yields a much stronger flour than the ordinary Federation.

Environment.

Environment does not produce fundamental changes in plants, though it appears to change their characters. Cook states that "All forms of environmental influence thus far discovered can be interpreted in one of two ways; either as limitations of existing characters or as substitutions."* The cactus does not owe its form and drought-enduring habits to the desert climate in which it thrives, but rather to the fact that its peculiarities have found space to develop in isolation from other plants. It grows better on irrigated soil, but is able because of its peculiar characteristics to live in arid places, where other plants would die. Winds, birds, and animals act as distributing agents, scattering seeds broadcast, and that certain plants predominate in a region is due to their natural characters having found the conditions best suited to their development and crowding out their neighbours. A variety of wheat will always tend to reproduce its distinguishing characters whatever the soil or climate may be. The breeder, however, cannot afford to give up continuous selection when once he has obtained a productive variety. Unless the influences both of heredity and environment are favourable to the conditions required by the plant, degeneration will result.

Influence of Climate.

It goes without saying that some varieties succeed better in certain climates than others, but in some seasons the general wheat crop of the State has a higher protein content than in others. This happens when there is dry warm weather preceding harvest, causing rapid ripening of the grain. In seasons when the ripening period is protracted, the grain usually has a larger starch content. We find, however, that a variety normally yielding grain of good flour quality will not be greatly influenced in this respect by the character of the season; it tends to reproduce itself faithfully. An irrigation given when the grain is nearing maturity causes the grain to be unusually starchy. Seed of any given variety grown at the Nyngan Experiment Farm under average conditions is more translucent in appearance than seed of the same wheat grown at the Cowra or Wagga Experiment Farms. Varieties introduced from Europe, even when described as early maturing wheats in their native country, usually ripen much too late for our climatic conditions even after many years trial. Very early ripening Indian wheats come into head nearly as soon, after years of cultivation here, as when first imported.

Influence of Soils.

Last season at the Cowra Experiment Farm wheat grown on a loamy soil grew plants with much more straw and flag than the same variety on stiff clayey soil. The wheat ripened more quickly on the loamy soil, and did not show the characteristic tints of the straw and head when ripe. One could

* O. Cook. Bulletin No. 136, Bureau of Plant Industry, page 19.

hardly tell from a casual inspection that the varieties were identical, although sown at the same time. It is said that on the black soil of the Gunnedah district, Zealand and Bobs do much better than on the red soil, but that Jonathan succeeds better on the red than on the black soil. Bobs grown in 1903 by Mr. W. Wilson, of Moonbi, gave the following results when milled by Mr. Guthrie :—On red soil, the flour strength was 48·5, and the dry gluten 7·4 per cent.; while on black soil, the grain gave a flour strength of 54·6, and 10·4 per cent. dry gluten. On rich alluvial soils, on which the crop tends to lodge after rain, and to "burn-off" in early summer, quicker maturing varieties should be sown than on upland soils. Although climate has more effect on the character of the grain than soil, there is need for more information in regard to the suitability of varieties for certain soils, so that the grower may get the best results from the types which go to make up his farm.

From the experience of Mr. Guthrie and Mr. Norris in milling our wheats, and from the comprehensive experiments of Le Clerc in America, there is no doubt that climatic conditions have more influence upon the wheat grain than differences of soil.

(*To be continued.*)

Treatment for Sand in Horses.

A Jugiong correspondent brought under the notice of the Department the fact that a good many horses in the locality had died from sand in the stomach, and asked for a cure.

In reply, the Chief Inspector of Stock stated that, of course, the best thing in such cases was prevention, but it was probable that the horses in the district had become sanded on account of the scarcity of feed and the dry season. They had, in consequence, fed close to the ground, and in some cases had licked up the sand, especially when there happened to be a salty taste about it. It was a common thing for horses to become sanded when on military service and tethered on sandy soil, and at times they had to be regularly muzzled between the times of feeding.

The best treatment was to give :—

1 oz. Chloral Hydrate,
1 dram Oil of Peppermint,
$1\frac{1}{2}$ pints Linseed Oil,

the whole of it to be well shaken and carefully administered to the horses as a drench.

Copious enemas of warm water were also beneficial, and bran mashes and succulent green fodder, if procurable, would also be found of great assistance in such cases.

Farmers' Experiment Plots, 1914-15.

Crops on Irrigation Areas.

R. W. McDIARMID, Assistant Inspector of Agriculture.

Spring-sown Maize.

Spring sowing on the Murrumbidgee Irrigation Areas has invariably given somewhat unsatisfactory returns, while midsummer sowing has given payable results. This is accounted for by the prevalence during the summer months of severe winds, dust storms, and extreme heat, which frequently catch the spring-sown crop at tasselling and cobbing time, and which usually are abating when the maize sown in midsummer reaches the critical stage in its growth. The adverse conditions dry the land out too rapidly, and hinder proper fertilisation of the grain. Moisture must be maintained in the soil for good yields, and with midsummer sowing this is more readily accomplished. The rains that fall during the autumn months also largely assist in the development of the grain.

For success with spring sowing, it is essential to have a soil that will absorb and retain large quantities of water that will stand to the plant from one watering till the next. A position sheltered from the westerly winds is also desirable. Irrigation is necessary every time the water is available, and a season like the past calls for a more frequent watering than is possible under present conditions. Of the three experiment plots, sown last September, one failed to produce payable cobs, and this was apparently due more to the infrequency of the waterings than to any other factor, it being watered monthly instead of fortnightly.

The accompanying tables show that maize can be grown here with spring sowing, but better results will be obtained with later sowings. The tables also indicate the date of sowing, the kind of manure used, and the quantity applied in each case. The manures did not have any marked effect. They stimulated early growth, but this was not noticeable for long. With ample water and judicious cultivation, the soils at present do not make much response to the application of artificial fertilisers.

Table showing Yields per acre from Spring Maize; size of plots, $\frac{1}{8}$ acre.

Variety.	Manure.	Mr. P. Gersbach, Farm 330, Leeton.*		Mr. J. Brentnall, Farm 41, Mirrool.†		Average.	
		bus.	lb.	bus.	lb.	bus.	lb.
Funk's Yellow Dent	Superphosphate 2 cwt. per acre.	37	0	30	34	33	45
Hickory King		24	40	12	43	18	41
Boone County Special		28	29	16	11	22	20
Hildreth's Yellow Dent		19	48	1	22	10	30
Reid's Yellow Dent		23	32	34	53	29	14
Leaming		28	29	23	24	25	54
Cornplanter		Failed to germinate.					

* Sown, 23rd September, 1914; harvested, March, 1915.

† Sown, 4th to 8th October, 1914; harvested, February and March, 1915.

At Leeton, Hildreth's Yellow Dent was sown too thickly, but thinned out. It is tall growing, and apparently more suitable for green feed than grain. The rainfall during growing period was only 188 points. This fell in September and December. The land used for the experiment was virgin country. At this same farm the germination of Reid's Yellow Dent was thin.

At Mirrool, Hildreth's Yellow Dent failed to germinate. The yields of Funk's and Reid's Yellow Dent are very satisfactory, and with a milder season and more attention should give even better results. A good deal of the grain was eaten by birds.

A manurial trial was conducted at Farm 330, Leeton, to determine the value of various fertilisers, the seed being sown at the same time as for the variety trial, the variety selected for the purpose being Funk's Yellow Dent. The results are shown in the accompanying little table.

TABLE showing results of Manurial Trial of Maize, Leeton.

Manure per Acre.	Yield per Acre.	
	bus.	lb.
Superphosphate, 2 cwt.	37	0
„ 1 cwt.	31	24
„ Nil	34	48
P5 (8 parts superphosphate, 2 parts sulphate of potash), 1¼ cwt.	35	32
W2 (6 parts superphosphate, 3 parts sulphate of ammonia, 1½ parts sulphate of potash), 1¾ cwt.	31	40

Summer Fodders.

The following report is prepared from the actual results of experiments conducted on the areas during the past summer. The summer was remarkably free from rain and very hot, and winds were prevalent. This necessitated very frequent watering and cultivation.

The crops under trial were Early Amber Cane, *Sorghum saccharatum*, Planter's Friend, mazzagua, cowpeas, maize, and sorghum and cowpeas mixed. Various manures and mixtures were compared with plots sown without manure. The results show that with such a bad season sorghum can be more or less successfully grown on most of the soils, the stiff red clays being the least suitable, while the grey soils have yielded very well. In some instances, the yields scarcely paid for the water and cultivation given the crop. The Japanese variety of millet was not included in the trials, for it is already extensively grown and well known by the settlers.

The planting season extended from early September till the end of December. In every case the land was well prepared before sowing, and in most instances retained sufficient moisture to germinate the seed, but unfortunately there were plots where it dried out too rapidly, and the germination was uneven. The seed was sown with a wheat drill, so arranged that the rows were from 2 feet to 3 feet apart. Cultivation was given as

required until the crop had developed sufficiently to shade the land and arrest excessive evaporation. The closer drilling gave the better returns, and from observation of the experiment plots and other crops on the area, it would appear that sorghums, drilled about 2 feet apart, give the best results. The land is shaded more quickly, necessitating less cultivation and furrowing, and the growth is finer, more suitable for feed, and usually taller. A very considerable amount of time and labour is required to cultivate and furrow after each irrigation if the rows are too far apart, and this may be saved and applied to extending the area sown by adopting the narrow or close drills.

The watering varied at each farm, according to the soil and the water available. On Farm 67, where the shallow soil overlies a stiff clay, particular attention was given to watering and cultivation, but the land would not absorb and retain sufficient moisture to meet the crop's requirements from one watering to the next. The yields were naturally low, and were scarcely payable. On Farm 392, where the lowest yields were recorded, it was necessary to irrigate in order to germinate the seed, and the land, being heavy, set hard, and caused poor growth, which in turn suffered from the depredations of rabbits occupying the adjoining vacant land.

Although the application of artificial fertilisers in most cases gave an increased return, the increase was so small that it is doubtful if at present the use of fertilisers will pay. The effect appears to be limited to stimulating the young growth, and diminishes as the crops mature. The soil on which the experiments were conducted varied from shallow red clay on Farms 67 and 392, to good deep friable soil on Farm 57, and "crab-holey" on Farm 918. At Mirrool the soil was either a red loam or a greyish loam.

The experiments brought under the direct notice of a good many settlers the different varieties of sorghum, cowpeas, &c., and the effect of artificial fertilisers. The following remarks on each crop indicate its individual merits :—

Early Amber Cane.—Though this variety did not yield so heavily as Planter's Friend, it is very early maturing, and usually produces two crops of green feed to one of Planter. The stems are finer and sweeter, and more suitable as rough hay for chaffing for stock. The yield from this variety ranged from 9 tons 8 cwt. 1 qr. on Farm 57 to 3 tons 4 cwt. on Farm 392. Stock appear to be very fond of this variety, and it is the general favourite.

Planter's Friend.—It is found that this variety is ready to cut when the second growth of the previous variety is available. It is coarser and thicker in growth than Amber Cane, and yields, in most instances, far heavier per cutting. It is particularly suitable for ensilage-making, and yields very heavily on the grey soils of the area. The best growth was made where the seed was sown late in November. The yields ranged from 10 tons 11 cwt. on Farm 918, to 3 tons 15 cwt. on Farm 392.

Sorghum saccharatum.—This variety is very much the same as Early Amber Cane. It is fine and early like the Amber Cane, but yielded slightly less per acre. The yield varied from 7 tons 17 cwt. on Farm 57, to 3 tons 15 cwt. on Farm 392.

Planter's Friend and Black Cowpeas.—Although this is a more suitable mixture than maize and cowpeas, it cannot be considered very satisfactory. Where the sorghum plants are scarce the cowpeas grow luxuriantly, but where the sorghum is thick the cowpeas become "choked out." In some instances the cowpeas climbed up the sorghum plants well, and made runners over 7 feet long, but generally speaking the growth was not good. Cowpeas grow too slowly for mixing with either maize or sorghum, and are best sown alone. The yield from the above mixture ranged from 10 tons 17 cwt. 3 qrs. on Farm 918, to 3 tons 11 cwt. at Farm 392.

Cowpeas.—These are good fodder and green manure plants, but very slow in growing. The Black variety invariably gives the heavier yield of green feed, while the White variety is earlier, shorter, and produces more seed. Cowpeas, both green and dry, are liked by stock, and should be grown more extensively.

Mazzagua.—This perennial variety of sorghum is referred to more fully under the next heading, but it may be mentioned here that, though sown in November last year, only a very few plants headed by the end of April. It is a coarse fodder plant, and occupies the land too long. On Farm 57 the yield reached 21 tons 8 cwt. 1 qr. per acre, while on Farm 67 it was only 3 tons 3 cwt. per acre.

Maize.—The maize seed failed to germinate in most instances, and when it did grow it never equalled the sorghums in yield. The best varieties for green feed appear to be the late ones, such as Red Hogan, Yellow Dent, and Golden Nugget.

Trial of Mazzagua.

The seed of the above variety of sorghum came from Queensland for trial at Yanco, but unfortunately it was lost for six weeks in the spring, and consequently the sowing did not take place as early as was desirable. It requires a long season with abundance of water for its development.

With a season like the past at Yanco, it needs irrigating every fortnight. It yielded well in places—up to 21 tons 9 cwt. per acre—but the growth was not complete when harvested, for only a few plants were showing flowering heads. When sown in the early spring in good soil and supplied with ample water, it would yield probably double the amount of fodder obtained in these trials. It throve best in the richer and more friable soils. In the heavy clay of Farm 67, which would not absorb or retain the water, the yield was only 3 tons 3 cwt. per acre.

It is sweet, like Early Amber Cane, and is relished by the stock as much as the other varieties of sorghum. It occupies the ground for a very long period before it can be fed to stock, and, therefore, is only likely to be grown for ensilage-making. Such crops as Japanese millet and Early Amber Cane will produce at least three crops in the time taken to produce one of Mazzagua. It has coarse stalks which require chaffing for use; it stools out profusely, and grows very full with abundance of leaves.

On Farm 57, where the soil was deep and friable, it grew 12 ft. 6 in. high, and yielded at the rate of 21 tons 9 cwt. 1 qr. per acre.

TABLE showing the Yields per Acre from Summer Fodder Crops, Murrumbidgee Irrigation Areas.

Variety.	Manure per Acre.	Mr. E. Lockwood, Farm 57, Leeton.	Mr. G. Piart, Farm 349, Leeton.	Messrs. Houghton Bros., Farm 818, Leeton.	Mr. W. Rawling, Farm 69, Mirrool.	Mr. C. M. Gilbert, Farm 50, Mirrool.	Messrs. Taylor and Hawkins, Farm 67, Leeton.
		t. c. q.	t. c. q.	t. c. q.	t. c. q.	t. c. q.	t. c. q.
Early Amber Cane	1 cwt. superphosphate ...	9 8 1	3 4 0	8 4 1	6 10 0	6 7 0	3 16 0
„ „	Nil	....	....	7 18 2	....	....	....
Sorghum saccharatum ...	Nil	7 17 0	2 17 0	6 9 1	6 2 0	5 12 0	3 18 0
„ „ ...	Nil	....	....	6 2 3	5 15 0	....	....
Planter's Friend	1 cwt. superphosphate ...	9 9 1	3 15 0	10 11 1	....	9 3 1	4 8 0
„	2 cwt. superphosphate ...	8 13 1	....	....	....	....	4 13 0
„	*P5, at rate of 1¼ cwt. ..	....	....	....	9 5 0	....	4 14 0
„	†W2, at rate of 1¾ cwt. ...	....	....	....	9 12 2	....	4 12 0
„	Nil	7 12 0	....	....	7 10 0	....	4 17 0
Planter and Cowpeas ...	1 cwt. superphosphate ...	8 8 2	3 11 0	10 17 3	9 15 0	9 15 0	4 11 0
Black Cowpea	„	....	....	8 4 1	5 17 0	6 4 1	....
White Cowpea	„	....	....	....	5 5 0	5 4 1	....
Mazzagua	1 cwt. superphosphate ...	21 9 1	....	11 8 2	....	....	3 3 0
„	Nil	....	....	7 12 3	....	....	....

* Eight parts superphosphate, 2 parts sulphate of potash. † Six parts superphosphate, 3 parts sulphate of ammonia, 1½ parts sulphate of potash.

On Farm 918, where the land was "crab-holey," the growth was very uneven, being almost double on the puffy parts to that produced in the depressions or heavier soils.

At the Yanco Experiment Farm a small plot was sown which grew to a height of 9 feet, and yielded 14 tons 12 cwt. 3 qrs. per acre.

The plot at the Hay Irrigation Area had not been harvested when this report was being prepared. The Superintendent stated that it was then 9 feet high, and only just commencing to head. He intended to leave it as long as the frosts did not kill it. Stock ate it readily, but it required watering every 14 to 21 days.

On Farm 67 the lowest yields were obtained. In places here it was 8 feet high, but the greater portion of the crop was only about 3 feet high.

If seed can be obtained it is intended to make sowings in the coming spring.

The Carbonising of Wool.

A correspondent who was thinking of taking up, in a small way, the carbonising of wool, or extracting seeds and burrs from wool by acids, asked the Department for some details of the process. In reply, the Assistant Sheep and Wool Expert, supplied the following particulars :—

The wool is first of all thoroughly cleansed, which can be done by scouring. It is then steeped in a dilute solution of sulphuric acid (oil of vitriol) for forty minutes or longer, according to the character and extent of the burr or other vegetable matter present. After this the acid is allowed to drain off; this can be done by laying the wool on, say, wire-netting stretched over a trough, so as to collect the acid solution, which could be utilised again.

In the mills the wool is then passed through the hydro-extractor, for the removal of all superfluous acid. Then it is dried at a temperature varying from 190 degrees to 212 degrees Fah., in order to effect the concentration of the acid on the vegetable matter; this requires about twenty minutes or longer.

After the drying process, crushing must take place. It may here be mentioned that crushing and drying are usually done in the same chamber, simultaneously; but this is not essential. Crushing is done by means of heavily weighted and finely fluted rollers. Combined with this is a process of willeying or shaking, in order to remove the dust produced. Neutralisation of the residual acid is then effected by immersion in a bath of soda carbonate. This is followed by washing with ordinary soap and water, and then rinsing in water only. Afterwards the wool is allowed to dry.

The strength of the solution is about one part of pure sulphuric acid to thirty parts of water. The exact strength is sulphuric acid, 8 degrees "Twaddell" (1·04 sp. gr.). If a "Twaddell" hydrometer be procured, one can make the test for oneself by bringing the solution up to 8 degrees, which is indicated on the hydrometer. The process is very simple.

When diluting the sulphuric acid great care must be exercised *not to pour the water on to the pure acid*, as if this course be followed, an explosion would most likely take place when using large quantities. *The acid should be poured into the water.* After the acid is diluted it is safe to pour water on it then, if further dilution is required.

In the process the acid concentrated on the material acts upon the oxygen and hydrogen present in the vegetable matter (probably in the form of water), leaving it in the form of a blackened mass, which is easily reduced to dust, as hereinbefore explained. The wool, however, is left intact.

Great care should be taken to see that the solution is not too strong, or that too great a heat is used in the drying process, otherwise the wool may be ruined.

Maize Improvement for Farmers.

H. WENHOLZ, B.Sc. (Agr.), Assistant Plant Breeder.

SYSTEMATIC selection of seed maize for definite improvement of yield and quality is but a recent development in this State, and the best and most far-reaching results will be obtained, not by confining the work to a small number of experiment farms, but by the successful introduction of the system in a less scientific and more practical form into the general practice of maize growers throughout the country.

The importance of adaptability to soil and climate as factors in obtaining increased yields is rapidly being recognised. Even with crops like wheat and potatoes, the value of selection is becoming known, whereas change of seed was formerly the usual recommendation, but with maize the question has never been in doubt. Yet it is surprising to find that many farmers do not yet grow their own seed maize, often obtaining it from an entirely different climate and soil. The results of this practice have been so striking that some of the better farmers now either get their seed from a neighbour or require a guarantee that the seed was produced in the district. But the best guarantee a farmer can have is to grow his seed himself, for even quite neighbouring farms sometimes differ appreciably in climatic and soil conditions.

The object of this article is to indicate to farmers the best system of evolving a strain of maize most suitable to their own conditions by raising their own seed.

Plant Improvement the Province of Practical Men.

Many farmers regard any form of plant improvement or plant-breeding as the province of purely scientific men, and they fear to intrude because of the technicalities associated with the subject. But the fact remains that all plant-breeders must adopt a practical attitude in their work in order to produce results of economic value. Shorn of the technical and scientific points which the trained scientist connects with plant-breeding work for the sole purpose of understanding the "cause of the effect," thereby enabling him to obtain the desired results more quickly, plant-breeding and improvement presents an interesting and useful field to the practical farmer, of which more advantage should undoubtedly be taken. It is significant that at least three of the best known varieties of maize at present grown in this State, viz., Leaming, Boone County White, and Reid's Yellow Dent were produced by practical farmers in the United States of America.

Most farmers realise the importance of maintaining or improving the efficiency of their stock by breeding, but the improvement of their crops is, though hitherto unrecognised, an equally important consideration.

Selection the Keynote of Improvement.

The term "maize-breeding" is usually considered by the uninitiated to mean the raising of new varieties by cross-breeding between existing varieties. This is the case with most other crops, but whereas these are mostly self fertilised, it must be remembered that maize is a plant which depends naturally on cross-fertilisation. In the case of self-fertilised crops (*e.g.* wheat), only those characteristics which are visible in the parent in a pure variety are transmitted to the progeny, and since undesirable characteristics cannot be eliminated, nor desirable ones added by selection alone, recourse must be had to securing new combinations of characters by cross-breeding and subsequent selection.

In a variety of maize, however, a good deal of latitude may be allowed in type, and the planting of one type, as denoted by a single ear, does not give in the progeny only the characteristics visible in the mother plant, but others which are derived from the male parent or (as is usually the case) parents.* Both from the point of view of yield and of quality these latter characters may be desirable or undesirable, and this can only be determined by the actual growth of the progeny. By continued selection of desirable characters visible in the mother plant, the proportion of these can be increased, and that of the undesirable characters diminished.

It will be seen, therefore, how ruinous to the farmer the practice of sowing unselected seed must be, and how a variety may be improved by the elimination of undesirable and the increase of desirable characters, accomplished by selection alone.

There is so much room for improvement in our varieties by this means that for many years, perhaps, this will be almost the only method resorted to under the term "breeding."

Breeding by Performance.

Any maize-grower will pick out an ear of maize and style it, according to his fancy, as a good or a bad seed-ear. Many men have different ideas as to the value of different ears for seed purposes, some even quibbling about a shade of colour. But none can say with certainty which ear will give the best yield. The anticipated yield is, of course, the standard of value in judging, but the fact remains that between two "good seed-ears" of the same variety selected by the same individual there is very often a remarkable and unexpected difference in inherent yielding capacity. The eye and hand are an aid to selection up to a certain point, but beyond that it is impossible for them to go. Constitutional strength or weakness lies hidden in the grain, and is only brought to light in the plant it produces, so that a very fine seed-ear from an æsthetic point of view is often beaten in producing power by one of only moderate appearance.

* For fuller information on the fertilisation of maize, see *Agricultural Gazette*, June, 1915.

Breeding for speed and staying power in horses is mainly based on performance, and the testing of individual dairy cows, as well as the initiation of egg-laying competitions amongst poultry, are instances of the prominent part performance is playing in the improvement of stock by breeding.

So, too, with plants the whole basis of the methods of improvement should be performance. Improvement in maize should follow along the lines of selecting those individuals whose producing power has proved to be superior in a comparative test. The method which is now used by all maize-breeders for improvement of yield and other qualities is known as the "ear-to-row test."

The Ear-to-Row Test.

In this test the grain from selected ears is sown in separate rows of equal length containing the same number of grains per row. At maturity the produce of each row is weighed separately, and the best yielding rows determined. Errors due to soil variation throughout the plot may be eliminated by planting every fifth row with a uniform sample of seed from four or five similar ears, preferably from the same row of the preceding year's test. As these rows do not require to be more than 2½ or 3 chains in length to bring out the differences in yield, usually a fourth or a third of the grain from the ear is sufficient to plant the row, and the remainder of the grain is kept in a separate bag and marked with the ear number and also that of the row in which the corresponding grain was planted; *e.g.*, "Ear No. 16, planted in Row No. 20."

Variations in Yield.

In a trial with selected ears of the variety Improved Yellow Dent, at Grafton in 1914, the highest and lowest yielding rows gave 96 bushels and 36 bushels per acre, respectively. With the variety Leaming, at Grafton this season, the yields ranged from 30 to 70 bushels per acre; and with Reid's Yellow Dent, at Narara, from 50 to 80 bushels.

Here we have two ears apparently equal as far as the hand and eye could judge, which would have been shelled into a bulk sample for seed maize. What farmer would use the remnant seed of the low-yielding ear or select ears from the poor-yielding row? Who would not eagerly plant the residue from the high-yielding ear, or be glad to have the high-yielding row standing in the field from which to select seed? For not only is there a wide variation in the rate of production between the two ears concerned, but the producing capacity of the ear is transmitted to the progeny in a marked degree.

When such variations exist between selected ears of a specific variety of maize, it may be said that the choice of a variety, important though it is, is not all that can be accomplished in any district. With the choice of a variety established, the selection of high-yielding ears of that variety is the next important step in the improvement of maize. There may, in many cases, be more variation between the yielding capacity of different ears within the variety than there is between two distinct varieties.

Causes of such Variations.

What is the reason for such variation? First of all, it is necessary to realise that maize is naturally a cross-fertilised plant and that it does not bear self-fertilisation or close-fertilisation (*i.e.*, fertilisation by closely related plants). It has been found that self-fertilisation so reduces the vigour of the progeny that, if continued for several generations, it usually results in barrenness or sterility. As self-fertilisation is likely to occur over part of the ears in some maize plants, we must look in that direction for some explanation of barren plants occurring in our crops. This also in conjunction with the fact that cross-fertilisation maintains or increases the vigour, is, perhaps, the largest factor in explaining the variation in yielding power between two ears of the same variety.

Other predisposing causes of such variation in yield are due to differences in:—(1) barren or "nubbin-eared" stalks due to other causes; (2) strength of stalk or resistance to lodging; (3) resistance to insect injury or fungus attack; (4) adaptability to climatic and soil conditions.

Composition of a Field of Maize.

Any field of maize of the same variety will be found to contain plants which differ in height, number and size of suckers, thickness of stalk, number of ears per stalk, height of ear on the stalk, length, coarseness and abundance of husk and the tightness with which it envelops the ear, length of leafy appendages on the husk bracts, length and thickness of ear shank, erectness of ear at maturity, abundance and width of foliage, number of nodes with brace roots, colour of silks and tassel glumes, abundance of tassel, colour of stem, time of tasselling and silking, time of maturity and other details.

Ears of the same variety may also differ in size, shape, length, circumference, number of rows, regularity of rows, space between rows, space between grain, filling of tip and butt, rounding of butt, colour of grain, colour and thickness of core, length, breadth and thickness of grain, character and depth of dent, shape of grain, size of germ, size of cap, hardness and chemical composition of grain, &c.

There are probably no two plants in the field which are uniform with respect to all these characters, and probably no two ears of one variety which are quite alike in the characters mentioned. But several plants or ears will be found to have some points in common.

Vigour due to Hybridity.

Although in the seed-bearing or mother plant all these characters are visible, it is not known what other characters are combined with them to form the seed, for with pollen from a number of plants flying about the field and different portions of the silk being exposed at different times, a large number of male parents may be represented in the seed on a single ear. The wider the difference in the number and degree of the characters of the parents combining to form a single seed, the greater is the hybridity contained in this seed and the greater also is the vigour of the progeny likely

to be. It will therefore be seen that the vigour of the plants in a single row from a single ear will depend on the number and degree of those characters of the unknown male parents which differ from those of the seed-bearing or female parent. It may even happen that part of the ear is self-fertilised, or that some of the male parents have some characteristics identical with those of the female parent. In these latter cases a comparative loss of vigour is likely to be the result.

This is to a great extent the explanation of the difference in vigour and yield between two ears of the same variety when tested in separate rows of equal length. This also explains why some varieties that have been kept exceedingly pure have been observed to "run out." This, again, is the explanation why the first generation of crossbreds between two different varieties, or between two separate strains of the same variety, in many cases yield better than either of the parents. This, still further, explains why the first generation of such a cross is so much superior in vigour and yield to second and later generations.

The increase of vigour due to hybridity shows itself mainly in accelerated cell growth and cell division, and consequently a greater amount of tissue formation—thereby ensuring larger vegetative and larger reproductive parts, which, in other words, means larger plants and larger or more ears per plant.

Selecting the Foundation Ears for the Test.

These, of course, should be selected in the field (*vide Agricultural Gazette*, September, 1914), for not only will undesirable field characters be thus largely avoided, but there should be increased yield due to this procedure, and a saving of time in deciding between ears in the final culling. About twice as many ears should be selected at first as will be finally required. The following more important field notes may be taken when selecting: Thickness of stalk, number of ears per stalk, height of ear on stalk, husk protection, length of shank, inclination of ear at maturity, and earliness or lateness of ripening relative to the rest of the crop.

Some knowledge of the type to aim for should be possessed by the "breeder," and, if he is not altogether certain of this, the results of the first year's test will help him considerably in this respect.

Each ear should be given a number for record purposes, and in addition to the field notes the observations on the following points may be recorded in order to help the breeder to identify the type planted in each row:—Length of ear, circumference of ear (one-third from base), shape, character of dent, number of rows, regularity of rows, rounding and filling of butt and tip, space between rows and grain, size of shank, thickness, breadth and depth of grain, colour, uniformity, and shape of grain, weight of ear, and weight of shelled grain.

After shelling off and discarding the irregular grains at the butt and tip of the ear, the remainder of the seed is put into a small bag ready for planting.

Planting the Ear-to-Row Plot.

Half an acre will grow thirty rows 4 feet apart, and $2\frac{1}{2}$ chains long. The plot should be situated on uniform ground, so that no row will have an advantage over another. If the ground is not uniform it will be advisable to plant every fifth row with uniform seed as a check. A shallow furrow may be opened out for each row with a single furrow mould-board or lister plough, and the grain should be planted by hand, and a record kept of the number of the row in which the particular ear is planted. Some difference exists between ears in the percentage of germination, but this is not always the fault of the seed, so that it would be better to sow, say, 200 or 250 grains per row; and, after counting the germination when the plants are about 6 inches above ground, to thin out each row to either 125 or 150 plants, according to the variety.*

One or two buffer rows from selected ears should be sown on each side of the plot, so as to prevent damage to the outside rows, and in order that these may have no advantage in space of feeding roots, or access to air and sunshine.

In order to prevent interpollination by other crops this test plot should be isolated from all other maize by a distance of at least 400 yards, or a period of three or four weeks should be allowed between the planting of this plot and other adjacent fields. At any rate, interpollination by different varieties —or by unselected seed of the same variety—must be absolutely prevented, as ears selected from high-yielding rows in this ear-to-row plot are used in the following year's plot.

Notes on the Growth.

The following notes on the growth or behaviour of the different rows may be made: Percentage of germination, date of first tasselling and silking, periods of tasselling and silking, percentage of suckers, resistance to insect or fungus diseases, resistance to lodging or weakness of stem, average height of growth, height of ears, average number of ears per stalk, erectness of ear, protection of husk, number of barren plants, and date of maturity.

Field Selection of Ears.

If it is desired to shorten the maturing period of the variety, the plot should be gone through just when the first ears are ripe, and if the maturing period requires lengthening, the selection should be done when the last ears are ripening. If it is not deemed advisable to harvest the selected ears at once, they may be marked with a piece of coloured cloth and collected just before the plot is harvested. When going through the plot for the purpose of making selections, it will be possible to tell fairly well which rows will be high-yielding and which low-yielding. It will not be necessary to mark any plants in a poor yielding row, as these will not be selected in any case, however good they may be. The number of ears selected in each row will be

* This can usually be done by sowing each grain about 8 inches apart in the row (giving about 250 grains per row), and then thinning as near as may conveniently be done to 16 inches apart, or about 125 plants per row.—ED.

determined partly by the appearance of the row itself and partly by the number of good ears in the row. It generally happens that the rows from which several good ears can be selected prove to be high-yielding, and this is what is required, for, in the following year's plot, only ears from high yielding rows are used. Should the breeder be not certain of the type to aim for, the type occurring most abundantly in the highest yielding rows will help him considerably in his choice.

Three or four times as many ears as are required for the next season's plot are selected from the field in this way, care being taken to keep each group of ears from each row separate, and to mark them with the number of the row from which they were taken.

Harvesting the Plot.

After the field selection of ears, and when the crop is quite ripe, the different rows are harvested separately and the product of each weighed. To this weight must be added the weight of the ears selected from each row. The weight of the ears will usually be found sufficient to determine the best yielding rows, but if greater accuracy is required the weight of shelled grain must be obtained. The percentage of shelled grain per ear will, however, not be found to vary greatly between the rows, so that little difference would be made to the order of merit in which the rows were placed by taking the weight of the ears alone. If anything, there is usually a slight correlation between high-yielding rows and high percentage of shelled grain, so that differences between the high and low yielding rows become more accentuated when the weights of the shelled grain are taken.

Having now determined the best yielding rows, the process of finally selecting the ears for the following season's plot can proceed. Ears which have nothing between them as far as the hand and eye can judge, will now be readily decided between when the yield of the row from which they were selected is taken into consideration.

The Second Year's Plots.

In the second year's test the ear-to-row plot will be similar to that of the preceding year, except that it is sown only with ears from the best yielding rows, but there will also be available a number of ears from these high yielding rows which may be used to sow a few acres of the field area.

We have also the remaining seed of the ears which have been tried in the first year's test, for, in most cases, only one-third of the seed would be used to plant the rows. It should not be thought that this seed is of no use on account of its age (*i.e.*, two years, or, more correctly, 18 months). On the other hand, it is very valuable and should be taken all care of, for its comparative yielding capacity is now definitely known, and if it has been well saved its capacity for germination should not be seriously reduced. Seed which has given 90 per cent. germination when kept from one harvest to the next planting, should give at least 80 per cent. germination when kept twelve months longer. The "remnant seed" from the best yielding ears is only in

a small quantity, and will therefore need to be multiplied by planting a small plot for the production of a larger quantity of seed to sow a field area. This plot is known as the "breeding plot."

The Breeding Plot.

The number of ears of remnant seed sown in this plot will depend on the yield figures for the corresponding rows of the first year, and on the purity and type shown in these rows. Obviously from what has already been said, it will not be advisable to strive after too great uniformity, but for the first year or two the differences in yield in the ear-to-row test will be so marked, and the rows will show so much hybridity, that no danger will be likely to arise from using only 2 or 3 lots of the highest yielding ear residues.

This seed may be sown in ear rows as before, and the alternate rows detasselled in order to get still more vigour into the seed. It is important that this breeding plot should be kept free from any interpollination whatever, even of the same variety, and as this is the plot from which the future seed of improved yield and quality is to be obtained, careful attention should be given to it. In the rows which are not detasselled, all weak looking plants should be prevented from producing pollen, as well as all apparently barren plants at the tasselling stage, so that the pollen distributed will come only from vigorous parents.

Detasselling, which is performed by pulling out the tassel as soon as it appears and before it sheds its pollen, does not occupy much time in individual cases, but the plot will require attention every second day at least, in order that no pollen may escape from undesirable plants, and from those which are to be detasselled.

Uniformity or Hybridity—Which?

In view of what has been said of the correlation between hybridity and vigour, it will be well to discuss this question more closely.

It seems at first sight that any attempt to get our varieties into a more uniform state would be a bad policy, but it must be admitted that many of them are at present not worthy of the name, owing to their very evident mixture.

There is no doubt that many maize crops are losing considerably in yield from the fact that they have too long a period between the ripening of the first and last ears. The result of this is that not only do the earliest maturing stalks become too brittle and break down whilst waiting for the later stalks to ripen, but also that a good many barren plants occur among the later stalks, because they have flowered (*i.e.*, silked) much later than the bulk of the crop, and there was no pollen available to pollinate them. This is one point, then, in which greater uniformity could be attained without any sacrifice in yield, and, indeed, attention to it should increase the yield.

Another characteristic which could well do with less hybridity is the colour of the grain. Shades of the same colour may be allowed in a variety, but they should not go to extremes, and different colours should not be

permitted. A variety should either be red, yellow, or white. A light red and a dark amber yellow do not, however, look too mixed in the shelled sample. A very deep red, or mixtures of reds and yellows, or yellows and whites, are not liked on the market, and they are often 2d. or 3d. per bushel cheaper. This means that they must yield from 5 to 10 bushels more per acre than varieties of uniform colour, and it is not yet proved that they do.

Uniform size and shape of grain is a necessity for obtaining a uniform "drop" with the planting machines. It is obvious that if there is much variation in this respect, a uniform stand will not be obtained and loss of yield results.

Generally speaking, a variety should be fairly uniform as to maturity, colour of grain, character of grain (hard or soft), colour of core (red or white), and general size and shape of grain. High yields have been obtained with varieties that are pure in these respects, and some uniformity is required in order that recommendations may be made of certain varieties for different climatic and soil conditions, for it is certain that once a variety becomes mixed it loses these valuable characteristics which have such a marked effect on yield. Even though a high yielding crop may consist of a number of very different types, there are some types which are high yielding and some low yielding, and by elimination of the latter the variety may be made more uniform and the yield improved at the same time.

It is thought that it will be possible, by allowing some latitude in characters other than those which are mentioned above, to retain sufficient hybridity to ensure vigour, and yet to keep the varieties true to name, not "mongrels," as some of them undoubtedly are now.

Different Systems of Improvement.

Undeniable as are the advantages of field selection over barn selection, there is a still further increase in yield to be obtained by selection from high-yielding rows or ears in the ear-to-row test.

The different systems of selection may be placed in order of merit as follows:—(1) Use of "remnant seed" from high-yielding ears. (2) Field selection from rows of high-yielding ears. (3) Field selection from ordinary field crop. (4) Barn selection.

The first is, undoubtedly, the surest method for obtaining the highest possible yield, but in order to plant a large area it means the use of a large number of rows in the ear-to-row plot. The same results may be attained by using a smaller number of ears in this plot and multiplying the remnant seed of the highest-yielding ears, by planting in an isolated breeding plot, as previously mentioned, and field-selecting from this plot to plant a larger area the following season. The only difference is that by this method one year is lost in obtaining sufficient seed to plant a field area, but the testing of a very large number of ears for yield would be cumbersome and scarcely practicable.

Subsequent Year's Work.

The ear-to-row test plot is, therefore, continued each year with the ears selected from the high-yielding rows of the previous year. In the second year there will be the "ear-to-row plot," and the "breeding plot" sown with the remainders of the high-yielding ears of the previous ear-to-row test. Seed selected from this breeding plot is used the following year to plant a larger area, called the "multiplying plot," and selected seed from this area is used to plant the field crop. Thus there is established a complete system of selection which cannot but make for continuous improvement.

The next best system, as previously mentioned, is based on field selection from high-yielding rows. It is definitely known that a high-yielding ear has the faculty of transmitting this tendency to its progeny, and if the farmer does not wish to go into the more elaborate, though not difficult, system just described, he may effect considerable improvement by eliminating the breeding plot and simply conducting the ear-to-row test each year, and selecting from the best-yielding rows to plant all or portion of his field area.

Conclusion.

Although the former system of improvement is the one which is strongly recommended to farmers, because of the increased yielding capacity and varietal purity obtained in a shorter time, any system which is based on selection by performance cannot fail to give success, and in addition, creates an interest which will stimulate further inquiry and which will lighten the labour of what must otherwise be the rather dull and monotonous work associated with this crop.

Weeds of New South Wales.

In connection with the discussion on this subject at the branches of the Agricultural Bureau, the secretary of the Tallawang Branch forwarded a specimen of a weed known locally as "Mrs. Gunther." He stated that the weed was named after a lady who was supposed to have first introduced it into the Mudgee district many years ago.

In reply, the Director of the Botanic Gardens stated that the weed was *Verbena bonariensis* L., which was introduced from South America. It is known in different districts by various names, "Blue Flower" (Dubbo), "Mother Gunther" (Mudgee), "Blue Weed" (Codrington), "Blue Top" (Grafton), and "Purple Top" (Casino). It has also been called "Cobbler's Pegs," "Vervain," and "Wild Verbena." It is not considered dangerous to stock, but is worthless as a fodder plant. It should be hand-pulled while young, and not allowed to seed.

The weed was described and illustrated on page 800 of the August issue of the *Agricultural Gazette* for 1906.

Farmers' Experiment Plots.

POTATO EXPERIMENTS, 1914-15.

North Coast District.

G. MARKS, Inspector of Agriculture.

POTATO experiments were carried out on the North Coast at five centres, the names and addresses of the experimenters being as follow:—

R. E. Burton Bradley, Irvington.
A. Pryor, Coramba.
F. Allard, Brooklana.
J. W. Smith, Wauchope.
A. McM. Singleton, Tinonee.

The season was a peculiarly unfavourable one for potatoes, not on account of want of moisture, but through an excess of it. It is very many years since the North Coast district had such a wet spring. It was with great difficulty that farmers were enabled to get their land ready for planting, and in innumerable instances plantings were, through the heavy rains, delayed up to a month beyond the usual time. In this respect the experiment plots were similarly affected. Efforts were made at all the farms to have the land ploughed a month before planting time, in order to ensure the benefits of the weathering influences, but in every instance the land was kept in a constant state of saturation after the first ploughing, and horses and implements had to be kept off almost till planting time.

Notwithstanding these conditions, and the repeated delays through rainstorms, all the plots were planted under favourable conditions. Great credit is due to all the experimenters for the manner in which they worked to prepare their land to assist the Department in carrying out these experiments. In some instances the land, after being well prepared and ready for planting, had to be ploughed three times running on account of continuous rainstorms, weed growth, and compaction of the soil.

In the selection of the lands for the experiments, due regard was given to the question of drainage and the prevalence of disease, and all the plots were planted on well-drained land, where excessive moisture would be able to get away quickly. At Mr. Singleton's farm on the Manning, portion of a lucerne paddock was utilised for the experiments. The deep alluvial soil was well prepared and in splendid order, and the plots were planted in bright sunshine with no immediate indication of rain, but within three days of planting 16 inches of rain fell, flooding the whole district. The plots were located on a gentle slope, and after the rainstorm had passed, it was observed that the soil, with the potato sets, had been washed away, plough deep, on the higher slope, whilst on the lower side the sets were covered with a foot of silt. This experiment was, therefore, short-lived, and was ploughed out later on for another crop.

October, which is usually one of the driest months on the coast, was this year one of the wettest, and at several localities up to 30 inches of rain were recorded where in normal seasons there would be no more than 2 or 3 inches, and that in the form of heavy thunderstorms. The presence of so much moisture in the soil, and the continued showery or wet conditions which continued till December, were responsible for a great deal of disease in all the potato crops, more particularly those situated on the low lands, which are but a few feet above high-water mark, and where, owing to the level nature of the country, drainage waters were not able to get away quickly. Of the diseases, Irish Blight and Bacteriosis were the most troublesome. This was not the first season of their appearance. They have been distributed throughout the whole of the Northern River districts for many years, but the losses occasioned by them are usually largely controlled by the dryness or otherwise of the season. It usually happens that about the time the tubers are commencing to form, dry and hot conditions set in and continue till after the harvesting is completed. This materially checks the spread of disease wherever it has previously appeared. Instead of these dry, hot conditions this spring, however, we had warm, steamy weather, which favoured fungus growth and bacterial activity, with the result that scores of acres of potatoes were destroyed in a few days.

The experiment plots did not escape. At Coramba, where the crops were very promising and were growing well, both Blight and Bacteriosis appeared. A large number of small tubers were obtained by harvesting the crop shortly after the tops were destroyed, but as no faithful comparisons could be made, either as regards the merits of individual varieties or the efficiency of the different manures applied, the yields were not weighed, and the experiments were accordingly cancelled.

At Wauchope the potatoes were planted on new land, or rather on an old pasture which had not been under cultivation for very many years. It was situated on the river bank, was well drained, and a good plant was obtained, but 20 inches of rain fell before the plants were fit to hill, and 8 inches afterwards—in all a total of 28·14 inches. With such a heavy rainfall, it could scarcely be expected that heavy yields would be obtained. As a matter of fact, the yields were light and the results not comparable.

At Irvington the land is of a very heavy type. In order to assist in improving its mechanical condition, a crop of field peas was planted the previous autumn and ploughed under in early spring with a single disc plough. A very prolific growth was made, and it was deemed advisable to cut up the succulent mass with a disc harrow prior to ploughing. The rainfall here was not nearly so heavy as at the plots already referred to; 8·95 inches fell during the growing period, and the yields were considerably higher. Two varieties, Beauty of Hebron and Early Vermont, could not be planted on account of the bad condition of the seed upon arrival. From the results it will be noticed that Satisfaction, Manhattan, and Up-to-Date gave the best results in the variety trials. In the manurial trials, P4 again gave the best returns.

At Brooklana, on the Eastern Dorrigo plateau, which is somewhere about 2,000 feet above sea level, the land, which is yet practically virgin, has greatly

mellowed down, and was in splendid mechanical condition when the plots were planted in December last. Owing to the bad condition of the seed, Beauty of Hebron and Early Vermont could not be planted. Of the total rainfall of 13·06 inches recorded, over 12 inches fell up to the period the tubers were forming, and only 1 inch from that time on to maturing. Had the rainfall been more evenly distributed, an exceptionally heavy crop would have been assured. In the variety trials, Manhattan and Up-to-Date gave the best returns. Early Manistee also did well, and promises to be a good variety. It is interesting to note that Satisfaction, though coming up well, yielded very poorly. In the manurial trials, superphosphate gave lighter returns than the unmanured plot, and the plot treated with 4 cwt. showed but a slight increase over that treated with 2 cwt. The mixture P4, on the other hand, showed a substantial increase, yielding an extra 22 cwt. per acre.

The fertiliser mixtures used were as follow :—

P4 : 4 cwt. sulphate of ammonia.
13 cwt. superphosphate.
3 cwt. sulphate of potash.

P5 : 16 cwt. superphosphate.
4 cwt. sulphate of potash.

The following table shows the respective yields :—

POTATO FERTILISER TRIALS, 1914-15.—North Coast District.

Manure per Acre.	R. E. Burton Bradley, Irvington.*				J. W. Smith, Wauchope.*				F. Allard, Brooklana.†			
Rainfall ...	8·95 inches.				28·14 inches.				13·06 inches.			
	t.	c.	q.	lb.	t.	c.	q.	lb.	t.	c.	q.	lb.
Superphosphate, 2 cwt.	4	14	1	4	1	17	2	2	4	0	2	4
,, 4 cwt.	4	5	2	27	2	0	3	1	4	2	2	0
No manure	4	6	2	3	1	13	0	22	4	8	1	16
P5, 2½ cwt.	4	8	1	27	1	10	0	6	4	10	1	12
P4, 3 cwt.	5	9	0	24	1	14	1	3	5	10	0	0

* Variety—Satisfaction. † Variety—Manhattan.

POTATO VARIETY TRIALS, 1914-15.—North Coast District.

Variety.	R. E. Burton Bradley, Irvington.				J. W. Smith, Wauchope.				F. Allard, Brooklana.			
	t.	c.	q.	lb.	t.	c.	q.	lb.	t.	c.	q.	lb.
Satisfaction	5	9	0	24	1	14	1	3	2	18	3	20
Early Manistee	3	15	2	3	1	12	0	24	4	14	1	4
Manhattan	5	6	1	13	2	2	3	8	5	10	0	0
Brown's River	1	16	2	4	1	5	2	26	....			
Up-to-Date	4	5	2	27	1	19	1	4	5	10	0	0

Each plot received a dressing of P4 Manure at the rate of 3 cwt. per acre.

South Coast District.

R. N. MAKIN, Inspector of Agriculture.

POTATO plots were planted in the spring of 1914 on the farms of the following farmers:—

T. Daley, Bomaderry.
J. Timbs, Albion Park.
J. Chittick, Kangaroo Valley.
J. J. Heffernan, "Yurragee," Moruya.
C. Sproates, Bega.
L. Carr, Unanderra.

Planting started on the 19th August, and proceeded until about the middle of September. In several cases the work was stopped on account of heavy rain. The plots selected embraced a variety of soils, all being typical of the potato soils of the district.

The objects of the experiments were to determine the suitability of certain varieties, and also the influence on the crop of certain artificial manures.

The Weather.

The weather conditions, covering the growing season, were unusual, in that the spring months were very wet—during September as much as 7 inches was registered. This had no serious effect on the crop, but in December as much as 10 inches was recorded, and the result was a serious loss through Wet Rot, Irish Blight, &c. The Unanderra plot was entirely destroyed, and all the others were affected. Of the varieties, Up-to-Date withstood these trying conditions best, whilst Beauty of Hebron and Early Vermont were worst.

Draining.

Until farmers make up their minds to effectively drain their farms little may be expected in the direction of satisfactory results from potato growing, for at the present time too much is left to chance. A move in the right direction would be to drain the better class of land by means of agricultural drain pipes. The four-inch pipes run into about £1 5s. per hundred, and placed from 18 inches to 2 feet deep in the ground, they would bring about a satisfactory improvement in the majority of cases. Where stones are to be had—and they are generally plentiful in basalt country—draining may be carried out by digging a trench the same depth as above, and filling in with, say, about 8 or 9 inches of stones. Before covering over it is advisable to lay something, such as tea-tree or paddy's lucerne, on top of the stone to keep the earth from falling between the stones. There are other methods of draining which need not be mentioned here, but any further information desired may be had on application to the Department. This point has been dwelt upon, because losses have been heavy owing to the drainage being faulty.

Cost of Planting.

A potato crop is one of the most expensive to plant; the average cost on the South Coast is about £2 8s. 6d. per acre, exclusive of seed. Early in the season seed is always dear, and taking it at about the average price of late years of £7 10s. per ton, and using 10 cwt. per acre, the cost of planting an acre of potatoes would approximate £6. This warrants care and forethought in undertaking to grow the crop.

It will pay, and pay well, to grow early potatoes in districts where frosts are not unduly frequent, providing suitable ground is selected and well worked, and the crop receives careful cultivation. It may also be found profitable to spray the crop as a means of preventing attacks of fungoid troubles.

Planting.

Planting may start as early as July in favoured districts, but as a general rule, August and September will be found fairly safe months. Should the crop be cut down once or twice in its early growth by frost, but little harm is done, but if good growth has been made and then the crop is frosted it results in a big loss.

Varieties under Trial.

Of the varieties tested during the past season, Up-to-Date, Manhattan, Satisfaction, and Early Manistee gave satisfactory returns. Of these Up-to-Date and Early Manistee resisted the wet weather conditions best. From a glance at the table of returns it would appear that Manhattan resisted the wet conditions well, but unfortunately this was not the case. All the largest sized potatoes of this popular variety were lost; had it not been for that the yield in many cases would have run into 10 or 12 tons per acre. It is satisfactory to record that potatoes of this variety were sold from one of the plots, early in the summer, at 11s. 6d. per cwt. Good prices were secured also for Up-to-Date.

The Early Manistee variety is new to the South Coast, and as far as the past season experiments are an indication, it is a most desirable variety for coastal conditions. It may be recommended on account of its earliness in maturity, and its good cooking qualities. It should take the place of the one-time popular Early Rose, should next season's experiments further prove its suitability.

Satisfaction gave returns on a par with experiments of other years, and is a reliable variety for South Coast conditions.

Of the other varieties, Early Vermont, Beauty of Hebron, and Brown's River, it was proved that they were not at all up to the standard of the others, and are not worthy of any further trial.

The Manurial Trials.

The manurial tests brought out no fresh information in regard to the action of artificial manure. Once again the addition of potash to superphosphate brought about satisfactory returns. On the average about 1 ton 4 cwt. was secured over the unmanured plot. The quantity of this manure,

which is known as P4, was reduced on this occasion by half cwt. as compared with the experiments of previous years, and considering the season was quite as satisfactory as before. P4 mixture, and superphosphate at the rate of 2 cwt. and 4 cwt. per acre were used, and, on the average, the less quantity of superphosphate gave the better returns, but as before mentioned, the addition of a small quantity of sulphate of potash gave still better returns.

In every district it was noted that there were more marketable potatoes on the manured plots than on the unmanured. The Manhattan variety was used in this test, and some excellent tubers were obtained; unfortunately, as before stated, in the majority of cases, it was the best sized tubers that were lost through the wet weather. In view of this, it may be said that the full effects of the manures are not seen in the returns here tabled.

The composition of the mixtures P4 and P5 are mentioned in the preceding report.

POTATO VARIETY TRIALS, 1914-15.—South Coast District.

Variety.	T. Daley, Bomaderry.	J. Timbs, Albion Park.	J. Chittick, Kangaroo Valley	J. J. Heffernan, Moruya.	C. Sproates, Bega.
	t. c. q. lb.	t. c. q. lb.	t. c. q. lb	t. c. q. lb.	t. c. q. lb.
Up-to-Date	6 8 3 20	3 0 0 0	1 15 2 24	4 9 2 16	5 10 0 0
Early Manistee ...	1 8 1 6	5 9 2 0	3 1 1 20	5 8 3 20	5 5 3 16
Early Vermont ...	1 11 1 0	Failed.	0 12 3 12	1 2 0 11	2 2 3 12
Satisfaction.. ...	3 18 2 8	2 4 2 8	3 12 2 8	3 10 0 10	4 3 1 6
Beauty of Hebron..	2 2 0 26	1 4 0 0	Failed.	1 14 3 8	0 15 3 16
Brown's River ..	2 5 1 22	1 16 0 0	1 7 0 16	0 16 0 8	1 17 2 0
Manhattan	3 18 0 14	1 18 3 16	5 5 2 24	2 17 2 10	6 3 1 16

POTATO FERTILISER TRIALS, 1914-15.—South Coast District.
Variety: Manhattan.

Manure per Acre.	J. Timbs, Albion Park.	J. Chittick, Kangaroo Valley	J. J. Heffernan, Moruya.	C. Sproates, Bega.
	t. c. q. lb.	t. c. q. lb.	t. c. q. lb.	t. c. q. lb.
P4, 3 cwt.	1 18 3 16	5 5 2 24	2 17 2 10	6 3 1 16
P5, $2\frac{1}{2}$ cwt	1 6 2 8	4 6 1 20	4 0 1 12	7 6 3 4
No manure	1 4 0 0	4 1 1 20	1 4 0 12	5 16 3 14
Superphosphate, 4 cwt.	1 6 3 16	4 13 3 20	1 18 3 10	5 18 1 16
,, 2 ,, ...	1 7 0 12	3 12 2 8	3 17 0 26	6 10 0 0

PURE BERKSHIRE BOARS AND SOWS FOR SALE.

YOUNG Boars and Sows by "Hawkesbury Augustus" (imp.) from selected Sows by "Yarra and "Manor Captain" are for sale at the Yanco Experiment Farm. Applications should be made to the Manager.

Late Blight of Potato.

COMMONLY KNOWN AS "IRISH BLIGHT."

G. P. DARNELL-SMITH, B.Sc., F.I.C., F.C.S., Biologist; and
E. MACKINNON, B.Sc., Assistant Biologist.

THE potato is liable to be affected with many different fungous diseases, but the most widespread and destructive one of all is "Late Blight." No fungous disease of any other plant has caused so much human suffering and so much monetary loss. If weather conditions are favourable for its development Late Blight may rapidly spread through a whole country, devastating the potato crop. All countries have had epidemics at some time or another, and the serious nature of this disease is seen from the losses that have been recorded, *e.g.*, in New York State, in 1904, the loss was £2,000,000; in Wisconsin, £1,000,000; Ohio, in one year, £100,000; New Zealand, 1905, £200,000. There were epidemics in parts of India in 1900 and 1912, and for the whole of the United States of America it is estimated the annual loss due to Late Blight is over £7,000,000. From 1840 to 1845 the disease spread over Western Europe, and in 1845 in Ireland a widespread outbreak caused an almost total failure of the crop, thus bringing about a terrible famine. From that time it has been customary for us to call the disease "Irish Blight." In New South Wales we had the most serious epidemic, commencing about the middle of 1909, and during 1910 it was widespread over all the potato-growing areas. It was also severe in all the other States, where it had been reported in all of them (except West Australia) one or two months before New South Wales. Owing to the dry conditions prevailing in Australia for the past few years we have not suffered much from blight; but with the return of more favourable seasons we should be prepared for fresh outbreaks. It will be readily understood that such a widespread disease, whose ravages result in such loss, would engage the attention of numerous investigators all over the world, with a result that further advances have been made in our knowledge of the life history of the fungus, the principal methods of infection, the persistence of the fungus in the tubers or the soil, and the best means of controlling the disease.

Several other diseases resemble Late Blight in the effects on the leaves, and others in the condition produced in the tubers. Hence there has been some confusion among growers in discussions on potato diseases, and it is clear that Late Blight is not readily recognised, and its undoubted presence sometimes denied.

The disease is caused by a fungus known as *Phytophthora infestans* (Montagne) De Bary. It is a native of South America, growing on the wild potato in Chile and Peru—the original home of our cultivated potato. The fungus is an active parasite, and can attack all parts of the plant—leaves, stem, and tubers. As a rule it does not attack the leaves until after the blossoming period; hence the name Late Blight.

It should be distinguished from Early Blight, due to *Alternaria solani*, which appears as dark, irregular spots on the leaves usually marked by concentric rings. These spots appear earlier in the season and more particularly in drier weather. The leaves may curl up and become brown, and often the spots fall out.

Another leaf condition that may be confused with Late Blight is "Tip Burn," in which the leaves also turn brown and curl up, beginning at the tips and margins.

Leaves affected with Late Blight usually become yellowish-green and develop characteristic irregular dark areas. These frequently appear near the margins and tips and take on a water-soaked, muddy-brown appearance. If the weather remains damp the diseased areas rapidly enlarge and blacken. The leaves become wilted and soon rot, emitting a strong odour. On the under surface, within the advancing edge of the patch, a delicate whitish mould or downy mildew may be seen, especially if the leaf is held in a very slanting position. The destruction spreads to the whole leaf and then to the stem. Finally the whole plant wilts and becomes a crumpled, rotten black mass. The appearance is somewhat like that resulting from a very severe frost. If a dry spell or a succession of drying winds should occur after infection, the brown patches may become brittle, crack, and dry up. This condition may mislead the grower, as the appearance is like that caused by Early Blight and Tip Burn. Very often the first signs of infection may be seen in the lower leaves on plants, here and there. Although the disease usually becomes serious after the flowering stage, plants may be attacked at any stage of growth. From the time of infection of a healthy leaf until outward visible signs of disease appear a period of only five days is necessary, when the new generation of spores produced will be capable of infecting neighbouring plants.

With favourable weather conditions an infected leaf may be killed in a day, so that all plants near the original source of infection may be killed within a week. The area of infection continually spreads and a field may be largely infected before the attack is noticed. The fungus may be spreading through many plants for days, living within the tissues without apparent injury to its host, and then suddenly assume a devastating virulence, a condition chiefly controlled by the weather, but also having some relation to the food supply afforded by the host plant.

Before the rapid killing of the potato plant takes place the fungus grows in the form of fine filaments or hyphæ, which thread their way chiefly

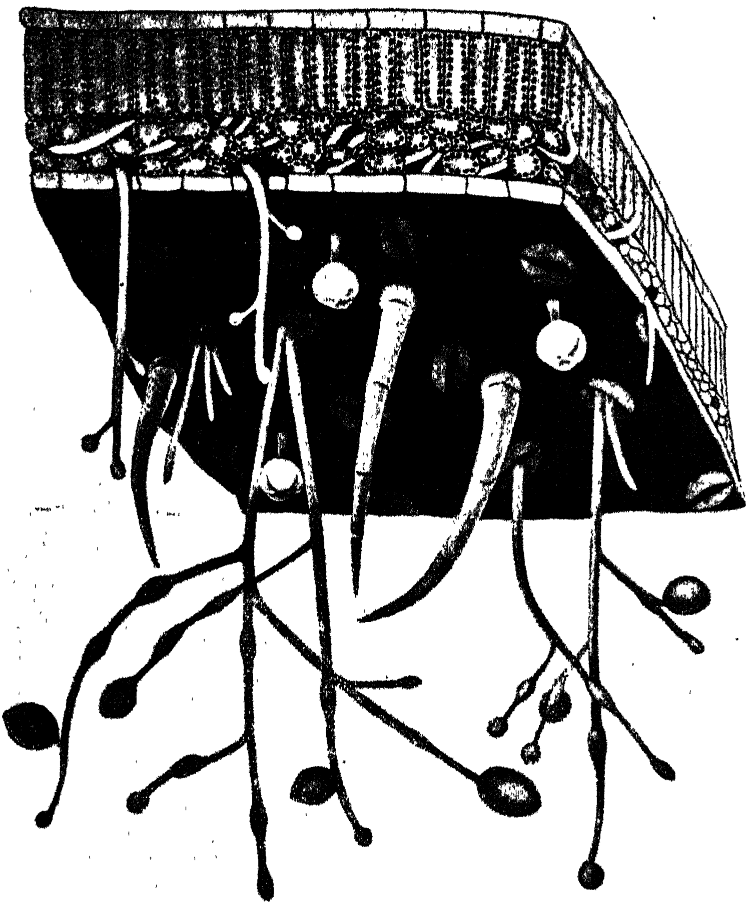


Fig. 1.—Diagramatic representation of a square cut from a potato leaf infected with *Phytophthora infestans*.

The branching conidiophores are shown emerging through the stomata on the under surface of the leaf, and bearing many conidia.

The other structures shown are two kinds of plant hairs (*a*) Long-pointed hairs, and (*b*) Short hairs with knob ends.

(Redrawn after Bureau of Plant Industry Bul. 245.)

LATE BLIGHT OF POTATO, COMMONLY KNOWN AS "IRISH BLIGHT."

between the cells, pressing closely against the walls, but frequently pushing them in and sometimes penetrating them. It has been shown also that they may send special absorbing organs (haustoria) or short branches into the cells. These enable the fungus to absorb its nourishment more readily from the cell contents, and are known to occur in any parts—the stems, leaves, or tubers, though not constantly.

The fungus may thus be said to pass through an incubation period, after which it prepares for reproducing itself. Through the openings (stomata) in the leaves on the under surface, it sends out branching filaments, called conidiophores or spore bearers (Fig. 1), on the ends of which its spores or conidia are produced. A conidium is formed first at the end of a branch, but later becomes pushed aside and remains for a time attached by a slender stalk, while the branch grows on and produces a second conidium (Fig. 2). This process continues many times, a new conidium being formed at the end, and a swelling marking the place where each previous one has been borne. These branching threads and their spores form the downy mildew, best seen near the advancing edge of the brown spots of the leaves. The production and further development of these conidia depend, as already indicated, on weather conditions. It has been proved by much experimental culture work—

(1) That the best growth of the fungus takes place between the temperatures of 60 and 70 degrees Fah.

(2) That above the temperature of 77 degrees Fah. no conidia are formed, but the mycelium continues to grow.

(3) That above a temperature of 88 degrees Fah. no further growth of mycelium takes place.

(4) That conidia also readily germinate between the temperatures of 50 and 77 degrees Fah.

Thus it is seen that great heat is not necessary; in fact the cooler temperatures are better if the supply of moisture is adequate. In many of our potato districts about the time of digging the tubers the temperature at night is quite suitable for the promotion of an active growth of the fungus, so that, with a few cloudy or wet days, there will be a continuous period of active growth of the fungus, finally resulting in a destructive epidemic. Should the weather become dry the conidia will soon perish and the development of the fungus and the spreading of the disease will be checked. It will thus be understood why some growers attribute the disease to the weather alone, and do not recognise the fungus as the cause, and so fail to take satisfactory measures to prevent the outbreak of Late Blight.

The conidia are the agents for the production of two important results :—

(1) Rapidly spreading the disease through a standing crop by infecting the leaves of healthy plants.

(2) Infecting the tubers and thus providing the means of propagating the fungus through its mycelium (collection of threads or hyphæ in the tissues), which assumes a dormant condition in the tuber.

(1) A conidium alighting on a healthy leaf, will, if weather conditions continue favourable, soon bring about infection. The contents may become divided up into a number (usually five to eight, but varying from three to thirty) of irregular masses of protoplasm, which soon escape from the enclosing wall of the conidium (Fig. 3). They become provided with two hairs or cilia, by means of which they swim about actively in the small drops of dew or rain collected on the leaves. These shapeless specks of protoplasm, living like minute animals, are called zoospores. They soon come to rest, lose their cilia, and become rounded in form, with a more definite envelope. They next push out a tube, which as it grows may become septate, or divided by cross walls, and branched. This germ tube may either enter the leaf through one of the breathing pores or stomata, or pierce the epidermis and grow into the tissues below. The fungus soon spreads its hyphæ through the tissues and finally reaches the reproductive stage again, producing new conidia, which commence the life cycle afresh. Under less favourable conditions the conidium itself sends out a germ tube instead of producing zoospores, and thus directly infects the leaf. Temperature has a certain influence on these results. At 50-66 degrees Fah. about two-thirds of the germinations are by zoospores, while at 77 degrees Fah. about half are by zoospores and half by germ tubes direct. The whole course of this development may be very short. Conidia have been observed to produce zoospores, the zoospores grow germ tubes, and the epidermis of the leaf to be pierced all within a period of three hours.

(2) Many conidia will fall to the ground and others will be washed down by dew and rain. These may reach the tubers in the ground and produce infection. This raises the question as to the best time to dig, when a field becomes badly blighted. If the tubers are dug while the ground is covered with diseased tops, immediately after their collapse, there is danger of exposing many to infection from contact with the diseased plants, whereas if left in the ground for some days there is the other possibility of infection by the spores washed down through the soil. It is also known that the mycelium may pass down the stem, and cause infection through the underground parts. Experiments have proved that there is less loss if the digging is delayed a week or more after the death of the tops, except in very wet weather and on low heavy soils, in which cases early digging becomes essential.

Infected tubers may show little or no change. Typically there are dark-coloured areas on the surface, which become more or less sunken and crumpled and easily stripped of peel. If the skin is removed from these areas brown patches or streaks are to be found just beneath, extending varying distances into the flesh. As the disease advances these brown patches extend further inwards, and finally the potato shrivels and dries. This condition has given rise to the name of Brown Rust. More frequently, however, the diseased parts become softened and emit a peculiar fœtid odour, or rapidly become a foul smelling, soft, rotting mass. This condition is brought about by the entrance of bacteria, which set up putrefaction. A sound potato infected with Blight alone will become brown and dry up. The soft rotten condition is the more

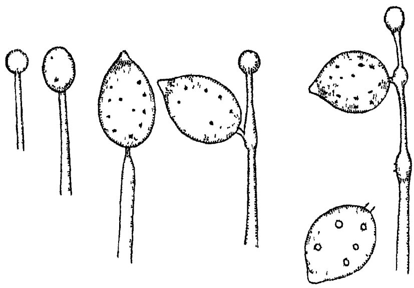


Fig. 2.—Sketch showing the successive development of conidia at the end of a conidiophore. (*After Ward.*)

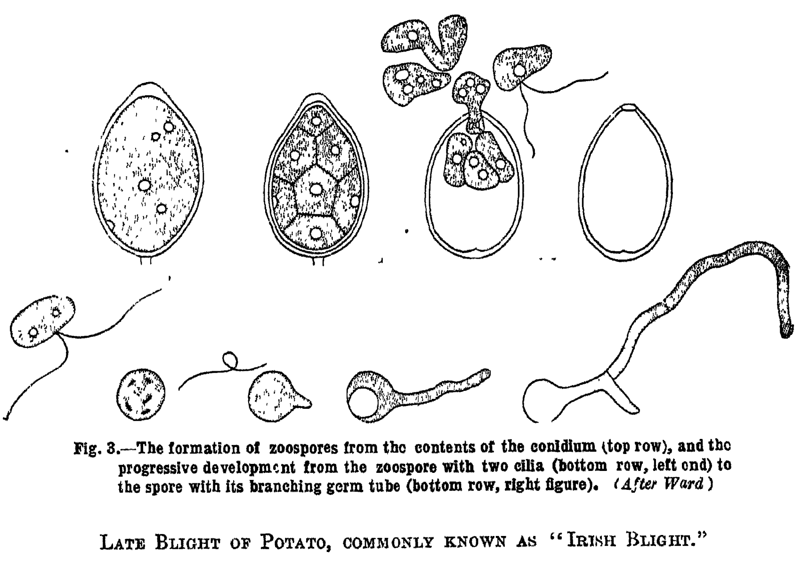


Fig. 3.—The formation of zoospores from the contents of the conidium (top row), and the progressive development from the zoospore with two cilia (bottom row, left end) to the spore with its branching germ tube (bottom row, right figure). (*After Ward.*)

LATE BLIGHT OF POTATO, COMMONLY KNOWN AS "IRISH BLIGHT."

usual, as potatoes are very often dug just after an attack, during damp weather. Without being cleaned or dried they are put into bags, and may remain in them for days during transportation. They are thus exposed, in the first instance, to every chance of infection, if not already infected, and then placed under conditions most favourable for the attack to spread. The bacteria follow in the wake of the fungus and complete the destruction, with the result that the potatoes often reach market in a soft rotten condition—a dead loss or even an expense to the grower. Unless the foul smelling rot is present some people think the disease is not due to Blight, while many growers attribute the wet rot condition to weather alone. While the presence of the fungus in the tubers may produce such changes, there may be, on the other hand, no visible indications of its presence. The mycelium may pass into a resting or dormant condition, and only resume its activity when the tuber is planted. This is the most important way in which the fungus is perpetuated and a new crop is infected. It is by this dormant mycelium that the disease has been spread all over the world.

When an infected tuber is planted the fungus may grow into the shoots produced, finally developing its spores which commence the infection of the new crop. Haulms and potatoes from a preceding diseased crop, if left in the field, may also cause infection. The fungus may also spread from tuber to tuber in the soil, more particularly when the soil remains wet.

Control.

The methods to be adopted for the control of this disease may be referred to under the following headings :—

(1) The use of blight-free seed.
(2) The treatment of the previous crop and its remains.
(3) Spraying.
(4) The use of resistant varieties.

(1) *The use of Blight-free Seed.*—As the mycelium may be dormant in the tuber, and often show no outward signs of its presence, no seed should on any account be used from a crop that is known to have been diseased. Seed should be obtained from a place known to have been free from Blight for some years. Any seed showing traces of "Brown Rust" should be picked out and destroyed by boiling or burning. Often the grower saves his own seed, after sending the best to market. It would pay him to keep the best for his own sowing, remembering that "the best is never too good."

(2) If the previous crop was potatoes which were blighted the infected field should be carefully cleaned. Parts of the plants, small or rotten potatoes left in the ground, and the soil are all dangerous, owing to contamination with mycelium or spores. All remains should be carefully collected and burnt on the spot. The practice of ploughing in potato haulms is liable to produce greater loss through disease than any increase in yield from the manurial value. It must be remembered also that infection may be carried

to other parts by the implements of the workmen. Where it can be arranged it is very advantageous to grow some other crop for the next season or two.

(3) *Spraying.*—There is now abundant proof that spraying has proved an almost complete remedy against Late Blight. It will not do to wait until plants show signs of disease. Spraying should commence early, and every care should be taken to thoroughly spray both the lower and upper surfaces of the leaves as well as the stems and the soil. It has been proved that spraying the soil prevents tuber infection by the spores that are washed down through the soil. Spraying must be repeated often enough to keep the whole plant covered with the fungicide, and to protect newly-formed foliage. It is not to be looked upon as a cure for Blight, as once a plant is attacked it is hopeless, and should be dug out and burnt. Several sprayings should be given in February and March to protect the plants from infection induced by the active growth of Blight owing to the summer rains. Either Bordeaux mixture containing 6 lb. copper sulphate, 4 lb. quicklime, in 50 gallons of water, is recommended for the spray, or Burgundy mixture containing 8 lb. copper sulphate, 10 lb. washing soda, in 40 gallons. In experiments conducted in Ireland the latter has proved the better spray.

(4) *Resistant Varieties.*—In countries where the disease has existed for many years it has been found that some varieties are much less liable to attack than others, and it should always be the aim of the grower to secure, if possible, a disease-resisting strain. It has to be remembered, however, that a variety that is resistant in one place may not prove so under different environmental conditions. A new variety called New Era has been grown for several years in New Zealand, and has so far yielded excellent results, both as to Blight resistance and yield. This variety was raised from a single plant that remained unaffected in a field that was entirely devastated by Blight. Much work of a similar nature is being done in New South Wales with our most resistant varieties, such as Queen of the Valley; but so far no variety has yet been produced that is totally immune to attack.

Seed Testing for Farmers.

The Department is prepared to test vegetable and farm crop seeds. Reports will be given stating the germination capabilities of the seed, its purity, and the nature of the impurities, if any.

Communications should be addressed to the Director, Botanic Gardens, Sydney. Not less than 1 ounce of small seeds such as lucerne, or 2 ounces of large seeds like peas, should be sent. Larger quantities are to be preferred. Seeds should be accompanied by any information available as to origin, where purchased, age, &c.

If a purity report only is desired, it should be so stated, to secure a prompt reply. Germination tests take from six to twenty days, according to the seed

Practical Irrigation-farming in Australia.

WITH SPECIAL REFERENCE TO FRUIT AND FODDER CROPS.

[Continued from page 578.]

A. M. MAKINSON, B.A., Organising Inspector, Agricultural Bureau.

PART II.

The Use of the Dumpy Level.—A Chain and Compass Survey.—Laying out an Irrigation Farm.

WHEN a piece of land suitable for an irrigation farm has been chosen and acquired, the first step is to clear the whole or as much of it as it is intended to plant immediately, and the next is to obtain a plan drawn to scale showing boundaries and contours of the levels.

The value of a plan drawn to scale, showing paddocks, fences, yards, tanks, and buildings for the convenient and economic working of a farm is widely recognised by up-to-date farmers, even in districts where there is no necessity for, or possibility of, irrigation. On an irrigation farm such a plan, showing in addition the levels of the surface, channels, ditches, directions of water-flow, and the position, form, and area of plantations, is of far greater importance, as it is indispensable for laying out the farm in the first place, and for the efficient working of it afterwards.

It is very desirable that the survey should be made, and that the contour plan should be prepared, by a professional surveyor, but an irrigation-farmer should understand the simpler methods used in the preparation of such a plan, in order that he may be able to work from it when laying out the farm, and to that end he should understand the use of the dumpy level, chain, and compass. With the aid of these instruments he may lay out the farm from the surveyor's plan, or if unable to obtain one, may make an approximate survey and draw a boundary and contour plan himself, which, if ordinary care and intelligence are exercised, will be sufficiently accurate for practical purposes. Every irrigation-farmer should be able to use a dumpy level with compass attached, and should possess one, or at all events be able to get the use of one when he wants it. It will be impossible for him to lay out a farm properly without it; and even if he gets this done for him he will be handicapped in his subsequent work unless he knows the levels of his land thoroughly, which he can best learn by taking them himself. A good instrument, with compass attached, and levelling staff cost from £10 to £15, and it is not to be expected that every irrigator will be able to go to the

expense of purchasing them for his own particular use; but as each farmer will only have occasional use of the instruments, they may be advantageously purchased, like other expensive but necessary equipment, such as motor, chaffcutters, binders, seed and fruit graders, on a co-operative basis, to serve the needs of half a dozen settlers in turn.

To make a chain and compass survey of an irrigation farm, and take the necessary levels, the following articles are necessary:—

Dumpy level with compass attached.
Levelling staff.
Surveyor's chain or steel tape.
A set of pegs or arrows.
A field note-book.

The Dumpy Level. (See Fig. 1.)

The dumpy level is *not* a complicated instrument, but the purpose of every part should be understood before an attempt is made to use it, otherwise it may easily be put out of adjustment.

The *spirit-level* (*G G*) is connected with the *telescope* by *capstan headed screws* (*X*) at one or both ends. In many instruments these are placed below the telescope (as at *L*), while the level and telescope are adjusted permanently by the maker, and only need alteration when the level has to be replaced through accident. *C B* is a small level at right angles to the main level, and assists in the quick setting-up of the instrument. *R S* is a ray shade which protects the object glass from the direct rays of the sun.

On the right hand side of the telescope is the *focussing screw*. Inside the telescope the larger lens is called the *object glass* and the smaller the *eye-piece* (*E P*). Next to the eye-piece is the aperture through which the eye looks into the telescope; this aperture is called the *diaphragm*, which can be raised or lowered by two capstan-headed screws, one above, the other below the telescope. On the diaphragm are *two vertical hairs*, midway between which the staff should show when an observation is being taken, and one *horizontal hair* which shows the reading of the levels on the staff.

Underneath the telescope is the *compass* on the side of which is a *small microscope* through which the bearing of the telescope may be read.

Underneath the compass is the *plate*, which is connected with the *seat* by a *ball socket* and four (or in some instruments three) *plate screws* (*P P*), by means of which the bubble is brought to the centre each time the instrument is moved. The *tripod* (*A*) screws into the seat. Some instruments have a screw which is a convenience for altering the direction of the telescope very slightly. A hook may be placed at *B* from which to hang the plumb-bob.

Objects viewed through the telescope are seen upside down, an inconvenience to which the beginner soon becomes accustomed.

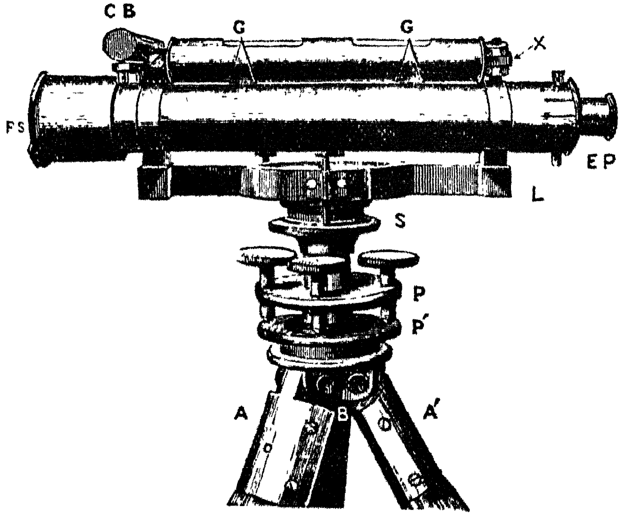


Fig. 1.

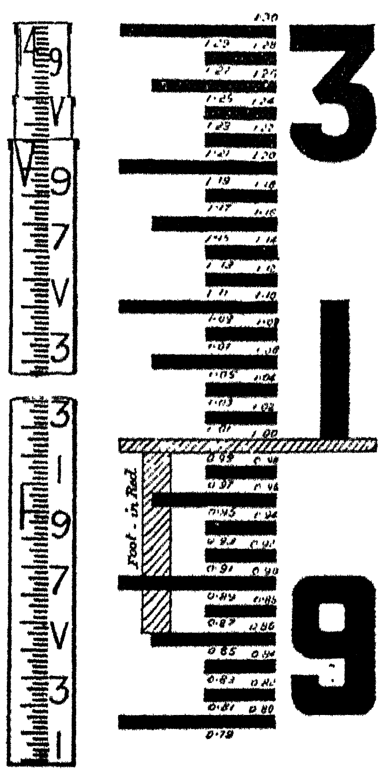


Fig. 3. Levelling Staff.

PRACTICAL IRRIGATION-FARMING IN AUSTRALIA.

The telescope of any dumpy level may be fitted by an instrument maker with two additional horizontal hairs, as shown in Fig. 2 by dotted lines (one on each side of the horizontal hair that shows the reading of levels on the staff), in such a way that they enable the distance of the staff from the instrument to be read upon the staff. These two additional hairs are so placed that 1 foot shows between them on the staff for every 100 feet the staff is distant from the instrument, so that the *number of hundredths of a foot showing between them on the staff indicates the number of feet the staff is distant from the instrument*. It is a great convenience to have a dumpy level fitted in this way,* as it does away with the necessity of chain or tape measurements and is more accurate.

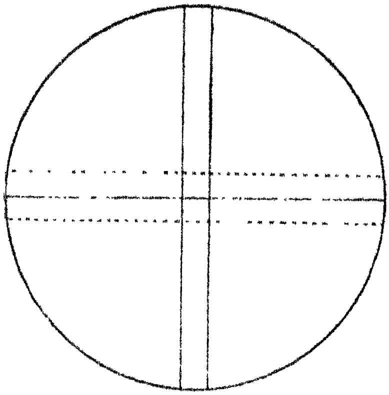


Fig. 2.

The Staff. (See Fig. 3.)

The staff used with the dumpy level is marked off in *feet, tenths of a foot, and hundredths of a foot*, not in feet and inches, and on this account it puzzles some farmers who are unaccustomed to the use of decimals. Farmers have been known to mark off a home made staff in feet and inches for this reason. Such a staff is serviceable enough for rough work over short distances, but is not to be recommended for use over long distances or when any great degree of accuracy is necessary. Reference to a book of elementary arithmetic will make it evident to any intelligent farmer that the difficulties of the decimal system are purely imaginary, or at most may be overcome by two or three hours' study. In America and other countries that have a decimal coinage the system is used and understood by everyone.

To read a level on the staff, observe through the telescope the foot-mark nearest below (after allowing for the fact that the whole of the figures appear reversed through the instrument) the level of the horizontal hair (9 for instance), and write it down immediately to the left of the decimal point—

9· ;

then count up to tenths of a foot from the foot-mark nearest below the level to the horizontal hair, and put that number (say 7) immediately to the right of the decimal point—

9·7 ;

then count up the hundredths from the nearest tenth mark below the level to the horizontal hair (say 5), and put that number in the second place to the right of the decimal—

9·75 ;

which is the reading required.

* It is also necessary that the instrument-maker insert a third (anallatic) lens between the eye-piece and object-glass. The instrument so fitted is called a Tacheometer. (See Cardew's Pocket Manual of Surveying.)

The Chain.

For the measurement of boundaries and areas a chain 66 feet long composed of 100 "links" is most convenient,* and is in general use. The 66-foot chain itself may be used, or a steel tape marked in chains and links on one side and feet and inches on the other. The chain and link measure is more convenient for measuring land than the yard and foot measure, because the length of a rectangular piece of land in chains, multiplied by its breadth in chains and divided by 10, equals its area in acres.

Just as the levelling staff is divided into tenths and hundredths of a foot, so is the surveyor's chain divided, 10 links being the tenth part of a chain, and 1 link the hundredth part, so, 57 chains 43 links is usually written 57·43 chains.

In measuring with the chain, ten wire pegs or arrows are carried by the leading chainman, who places one of them in the ground to mark every chain after being "sighted" by the follower.

The second or following chainman picks up each peg as he passes from point to point, and when he has nine pegs in his hand and one in the ground, ten chains are registered in the field note-book. In practice, the tenth peg is often replaced by a wooden one driven into the ground to stop there as a permanent mark. The ten pegs are handed over to the leading chainman, and the process repeated as often as necessary.

The Field Note-book.

The field note-book for a chain and compass boundary survey may be ruled off and headings written in as follows:—

CHAIN and Compass Boundary Survey.

Corner Pegs.	Distance from "O."	Compass Reading from "O."	Distance between Corner-pegs.	Remarks.
	chains. links.	deg. min.	chains. links.	
I				
II				
III				
IV				
Etc.				

A Simple Method of Making a Compass Survey.

Pegs, preferably of triangular sawn timber, should be prepared, and one put in at each corner of the farm. Number the most northerly corner

* A chain 100 feet long is more convenient for the measurement of *quantities* in earthworks, tanks, &c.

peg I and successive pegs II, III, IV, &c., in Roman numerals. It is usually convenient to work clockwise, or in the same direction as the figures on a clock. (See Fig. 4.)

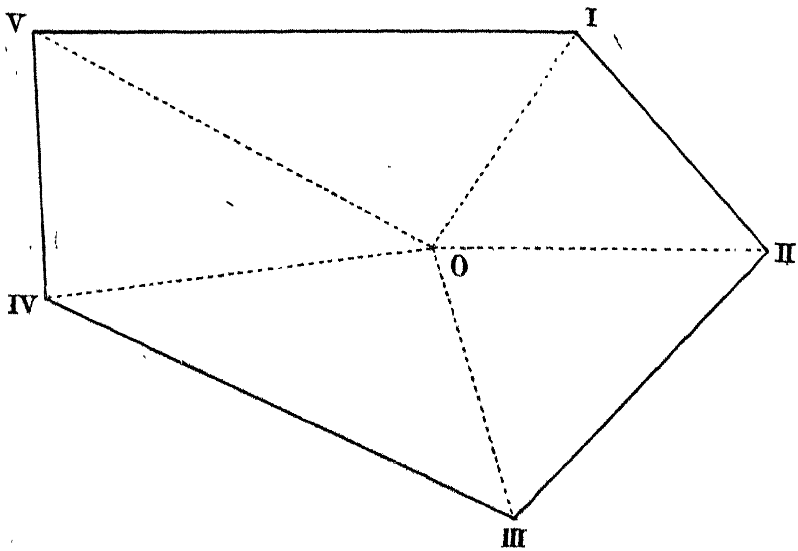


Fig. 4.

Then choose a convenient spot, somewhere near the middle of the farm, from which the staff can be seen through the telescope when held at each corner-peg; put in a peg there and number it O. Use a small plumb-line to set up the dumpy level, with the centre of the tripod exactly over the peg O. Measure the distance from O to I, and enter it opposite I in the field-book, send the staff-holder to hold the staff at I, work the plate-screws of the level till the bubble is approximately in the centre, and free the compass; then focus and turn the telescope till the staff shows exactly midway between the two vertical hairs in the telescope. Read the number of degrees and fractions of a degree* showing through the microscope on the side of the compass, and enter the reading in the proper column in the field-book opposite I. Chain the distances, and take the compass readings from O to II, O to III, and so on successively, and then on the boundary from I to II, II to III, and so on, entering each in its proper place in the field-book. We have now in the field-book all the information necessary for drawing a plan of the boundary to scale.†

* The compass reading will of course be approximate, but should not err by more than one quarter of a degree (15 minutes). An error of 15 minutes will mean an error of 3½ inches in the position of the staff for every chain that it is distant from the instrument—an error of 11 feet 8 inches in a quarter of a mile.

† If measurements and bearings cannot be conveniently taken from a point in the middle of the area, because it is too large or for other reasons, each angle and side of the boundary may be measured from one corner to another. If this is done, either a pair of parallel rulers, in addition to the compass card, or a protractor will be needed for drawing in the angles.

Drawing a Plan to Scale.

The materials required are:—

- A 10/20 scale (*i.e.*, a wooden scale, usually 12 inches long, with the inches divided into tenths on one edge, and the half inches divided into tenths on the other).
- A T square.
- A 6-inch 45° square.
- A hard (4H) pencil.
- Drawing paper and pins.

Drawing a plan to scale consists in making all distances on the paper proportional to the actual distances on the ground; for instance, on a plan drawn to the scale of an inch to the mile, any distance measuring a mile on the ground measures an inch on the paper. The proportion between the actual distance on the ground and the distance on the paper is called the scale, which may be any proportion that is convenient.

A scale of 2 chains to 1 inch will be suitable for a fifty-acre farm.

Pin the paper to a board or table, and draw in the scale that is to be used at the bottom. When the scale is drawn, pin the leaf, on which a plan of the compass is printed, to the middle of the paper, with north pointing towards the top. The centre of the compass will represent the peg O on the plan. At the top of the paper draw an arrow pointing due north. Then from the centre of the compass card measure off the angles and distances as shown in the field-book to corner-pegs I, II, III, &c., with the scale, and mark the position of each corner peg with a point and number it. Join the corner pegs, and the boundary plan is complete.

The plan may be checked by measuring the distances *between* corner pegs on the plan, and comparing them with the distances as shown between them in the field note-book. The angles taken from O should, when added together, equal 360°.

To Find Areas from the Plan.

(1) *If the land is rectangular*, by multiplying its length in chains by its breadth in chains, the result of which, divided by 10, will be the area in acres.

(2) *If the land is not rectangular*, by dividing the area into triangles, as shown in Fig. 5, then, with the square, drawing perpendiculars from the

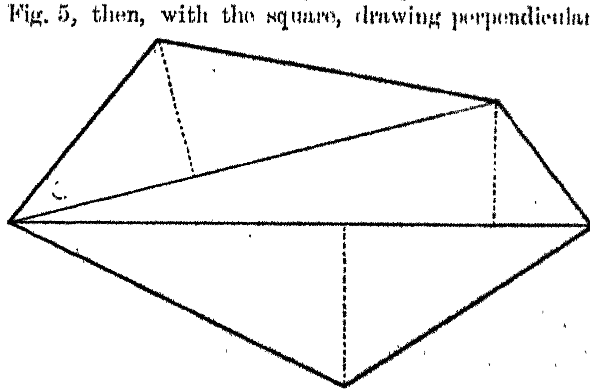
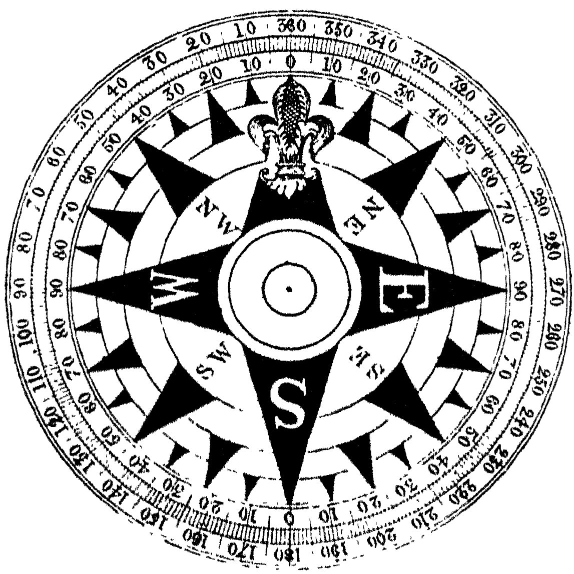


Fig. 5.



CARD OF COMPASS.

This may be mounted on stiff paper or card, and used for drawing the plan to scale as described.

greatest angle in each case to the opposite side. The area of each of these triangles may be obtained by multiplying the perpendicular by the base and halving the product, and when added together will give the total area required.

The Taking of Levels.

Having made an approximately correct plan, drawn to scale, and showing the boundaries, it is necessary to obtain and mark in the differences in the levels of the surface. Before doing so, unless it is known definitely that the dumpy level is properly adjusted, the instrument should be tested, and adjusted if necessary, as follows:—

Adjustment of the Level.*

That the level may be properly adjusted two things are necessary.

(1) That the bubble when in the centre of its run should be perpendicular to a vertical straight line (called the vertical axis) passing through the centre of the instrument. To find out if this is so, turn the telescope so that the spirit level is parallel with any one pair of plate screws, and bring the bubble to the centre by working those plate screws; then turn the telescope the opposite way round and the bubble will still be in the centre if it is perpendicular to the vertical axis; if it is not still in the centre, bring it half way towards it by turning the capstan-headed screws C C, and the rest of the way by working the plate screws to which it is parallel. Turn the telescope back to its first position, and repeat the process until the bubble will stay in the centre in either position. Then turn the telescope at right angles to the same pair of plate screws, and bring the bubble to the centre by using plate screws only. The bubble will now be perpendicular to a straight line from the centre of the instrument to the centre of the earth, and will remain in the centre of its run in whatever direction the telescope is turned.

(2) It is necessary that the *line of view* (technically called the "line of collimation"), from the centre of the diaphragm to the centre of the object glass should be parallel with the bubble. To find out if this is so, choose an approximately level piece of ground, and put in two pegs A and B, say, 300 feet apart, and approximately on the same level as far as can be judged by the eye. Put in a third peg C midway between them (as in Fig. 6).

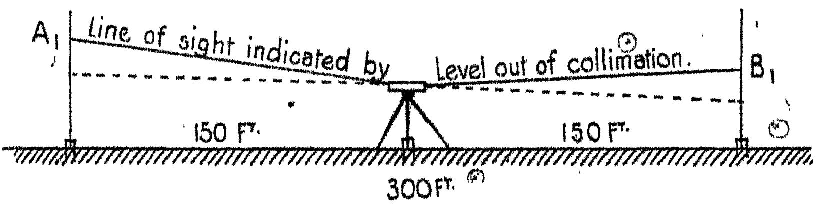


Fig. 6.

* It is advisable to get the instrument adjusted by a professional man, if possible, or at any rate by one thoroughly familiar with the instrument.

Set the level up over C, and take readings of the staff held on peg A and on peg B. If the readings are not the same, drive the higher peg into the ground until the staff reads the same when viewed upon it as upon the other peg. Then move the level as close as possible to A, and take fresh readings of the staff held at A and at B (as in Fig. 7). If these readings are the

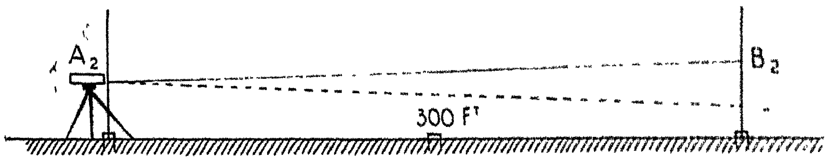


Fig. 7.

same, the instrument is in proper adjustment; if they are not, the diaphragm must be raised or lowered by means of the capstan-headed screws until they are. The instrument will then be correctly adjusted.

To prepare the Land for taking Levels.

Peg out a base-line AB connecting two known points,* and put in sight sticks at intervals of 2 chains along it (as in Fig. 8). At one of these pegs E,

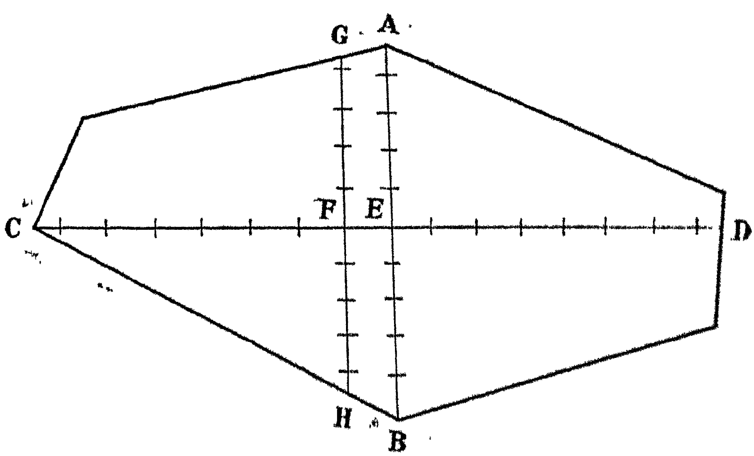


Fig. 8.

strike off a straight line CD, at right angles with AB. At F, a point on CD, 2 chains from E, strike off a straight line GH, at right angles to CD, and put in sight sticks at 2 chain intervals along GH, each way from F. By keeping the sight sticks at E and F in line, put in pegs 2 chains apart on CD; and keeping each other pair of sight sticks on AB and GH in line in turn, put in pegs 2 chains† apart, each way over the whole of the land. Mark pegs on the base-line A, B, C, &c.

* It will generally be most convenient to let the base line run with the steepest grade.
† Where the work to be done or the country is difficult, it may be advisable to put in the pegs a chain apart one or both ways.

The field note-book for taking levels may be ruled off as follows:-

Peg.	Back-sight.	Height of Instrument.	Fore sight.	Elevation.
X	3·17	103·17	... ..	100·00
X, 1 ...	4·90	101·48	6·59	96·58
X, 2 ...	......	......	5·83	95·65

The starting point (or bench-mark) will be the level of the surface of water in the channel at the point where it is delivered to the farm. This point may be called "X," and its height assumed at 100 feet.

The first step will be to run a line of levels from X to A, which will be done as follows:—

Send the staff-holder to hold the staff at X, and set up the dumpy level at some distance (1 to 5 chains) in the direction of A. Take a sight back at the staff and note the reading (3·17) under back sight opposite X. Add this reading to the (assumed) height of X, and place total 103·17 under "Height of Instrument," which it actually represents. This latter reading is called an "intermediate."* Next send the staff holder about the same distance towards A, without moving the instrument, and take a fore-sight (say, 6·59), and note it under fore sight, opposite X, 1. Subtract this reading from the height of the instrument, and the result (in this case 96·58) is the elevation of X, 1. The dumpy level is now moved a further stage towards A, and a back-sight is taken at the staff where it stands at X, 1 (say, 4·90), and this reading is added to the elevation of X, 1, which gives the height of the instrument in its second position (101·48); the staff is again moved forward, without moving the instrument, and a fore sight taken (5·83), which subtracted from the height of the instrument (101·48), gives the elevation of X, 2 (95·65), and the whole process is repeated until the staff-holder reaches A, and the elevation of A is found. From A the levels are taken at A1, A2, and so on, on either side of the base line, and so from B, C, &c., until the elevation of every peg has been ascertained.

When the elevation of every peg has been noted in the field-book, the position of each peg and its elevation may be marked in pencil on the plan, as shown in Plan *A*, and the contour lines may then be drawn in, by joining points that are on the same level as shown in Plan *B*. These plans are taken from a leaflet by Mr. G. H. Tolley, of the Water Conservation and Irrigation Commission, together with his note. A little study of the note will show that it is not absolutely necessary for an experienced surveyor to put in a peg at every point where the staff is to be held, after the method described above; but beginners will in most cases do well to put in a peg at every point, and so avoid the possibility of mistakes in sighting.

* Where it is convenient to do so, any number of intermediate sights may be taken without moving the instrument, but where great accuracy is desired, approximately the same distance should be maintained between the instrument and staff.

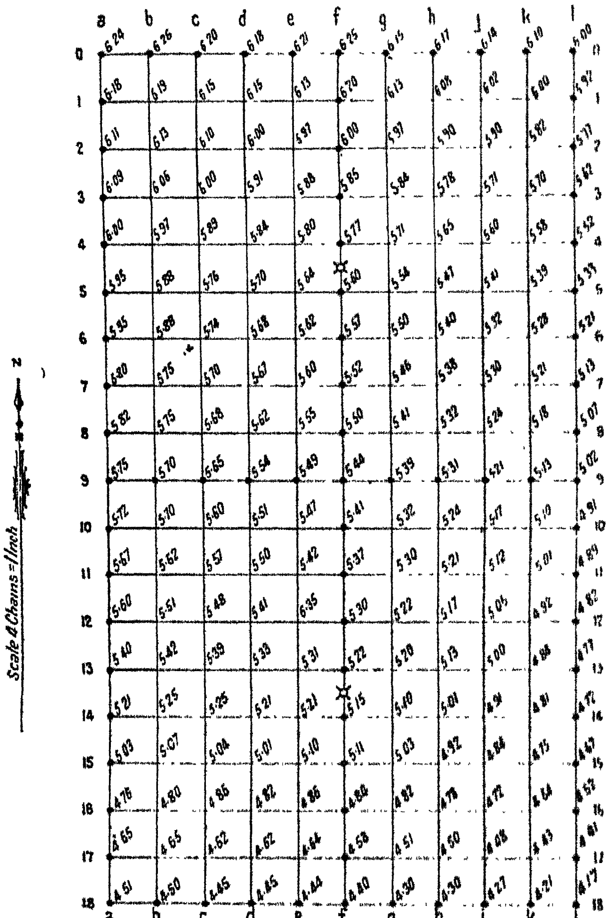
No 1

PLAN OF FARM

SHEWING

Levels taken for Irrigation purposes

TYPICAL EXAMPLE



PLAN A.

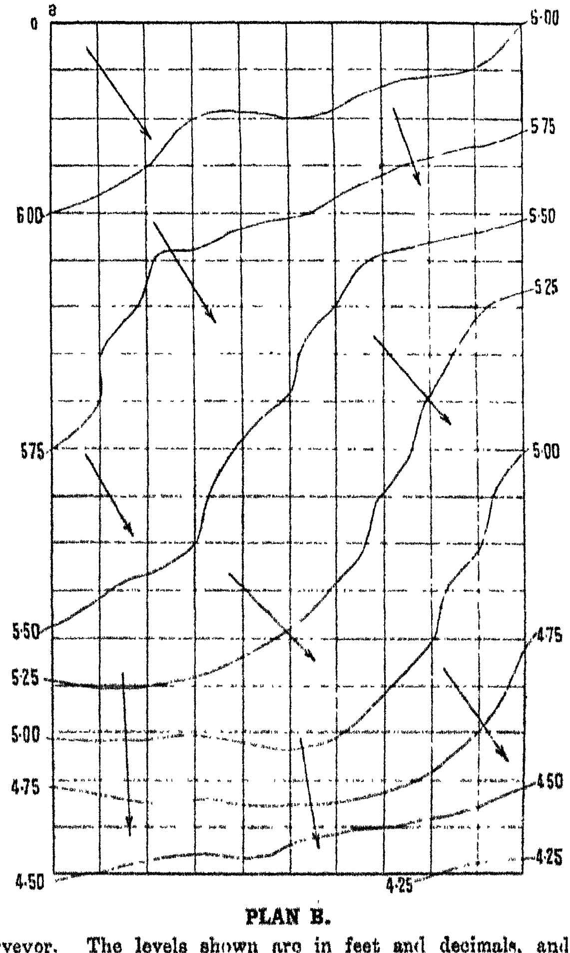
The drawings are to a scale of 4 chains to 1 inch, and Plan A is marked out in chessboard fashion in 1 chain squares, and in the manner in which the levels should be taken. For purposes of identification, the north and south lines are marked A, B, C, &c., and the east and west lines 0, 1, 2, 3, &c., from which any point may at any time be readily located. A convenient method of marking out for survey purposes is by means of rough stakes, about 2 feet 6 inches long, placed at the points marked by black dots only.

In Plan A the points marked thus * indicate the positions for setting up the level, and the staff men can readily find their positions by means of intersecting the stakes, a few feet from the actual position being in most cases immaterial. Greater refinement of levelling or variation of method is left to the ingenuity

No. 2 THE SAME FARM

SHEWING

Level Contour Lines



PLAN B.

of the surveyor. The levels shown are in feet and decimals, and, being all referable to a common datum, are easily comparable. To make this clear, the level shown at north-west corner of drawing is 6·24, and at south-east corner 4·17. The difference is 2·07, indicating that the latter point is 2 feet 1 inch lower than the former.*

With the levels shown on Plan A level contours may be drawn, as shown in Plan B, where they are spaced at every 3-inch change of vertical height. These will immediately indicate the conformation of the surface, the flattest portions being where the contour lines are farthest apart. The natural tendency of water is to flow at right angles to these contours, and is indicated by arrows on the drawing.

* It is desirable that these levels should be connected to some permanent mark for purposes of subsequent reference, as the development of the farm proceeds.

It should be noted that—

1. A contour line can never end anywhere on the plan but by running into itself or passing over the boundary.
2. Where the exact height through which a contour line passes does not show on the plan, its position is estimated between points higher and lower.
3. The contour lines should be drawn in to show levels at regular intervals of 6 inches, when it is proposed to irrigate by the furrow system, and of 3 inches when it is proposed to irrigate by flooding. The more level the land is the smaller should be the intervals in the levels shown by the contour lines.

The Question of Drainage.

The necessity for the adequate drainage of irrigated land has come to be widely realised, and the benefit to be derived by freeing "wet blocks" from their surplus moisture by means of draining tiles or shafts has been amply proved in Mildura and elsewhere; but these expedients should only be necessary in exceptional cases. A block should not be allowed to become water-logged; when it does it is generally due:—

(1) To the selection of an unsuitable site;

(2) To the faulty laying-out of the property for irrigation; or

(3) To the misuse of water.

The first alternative has been dealt with in the article preceding this; the second will be discussed hereunder, and the third in a succeeding article.

Laying-out an Irrigation Farm.

Perhaps the most important task an irrigationist has to face is the laying out of the farm in one or more blocks, grading them, and constructing channels—for if an irrigation farm is badly laid out, if the channels are put down in the wrong places, or the land spoiled by over grading, a man will only waste his time and his capital on it in the future.

The laying out of almost every farm may be said to be a separate problem, and the advice of an experienced irrigationist should, when possible, be obtained as to its smallest details. With such advice, and attention to the following objects to be kept in view, ordinary difficulties should be readily overcome.

(1) To be able to give every part of the land to be irrigated as near an equal quantity of water as possible, avoiding the necessity of giving too much to one part in order to get enough to another part.

(2) To lay out the blocks so that they will require the least possible amount of labour, and so that in those portions watered by the furrow system, the water will not need constant attention during an irrigation if the sluice-boxes have been properly set.

(3) To provide surface drainage when it is possible to do so.

(4) To move as little surface soil as possible in grading.

Laying-out Land for Irrigation by the Furrow System.

After clearing and before ploughing a proper contour plan of the levels of the land should be obtained. The water will be delivered at the highest point of the irrigable land, and it is from this point that channel construction will begin. Generally speaking, head ditches (*i.e.*, channels from which the water runs direct into the furrows) will cross the lines of contour, and the water furrows, in the rows of trees or vines that are to be planted, will follow them. In determining the directions in which the head ditches shall cross the lines of contour, and the angles which the water furrows shall form with the ditches, the first considerations will be the length of run and the fall to be given to the water furrows. The length of run to be given will depend on the fall, and conversely the fall to be given will depend on the length of run. A run of 7½ chains with a fall of 4 to 6 inches to the chain, may be taken as a working standard, not always to be attained, of course, but to be approximated. Where the fall is greater the length of run given to the water should be greater, and where the fall is less the length of run should be less. The length of run, however, should rarely be less than 6* or greater than 10 chains, or the fall less than 4, or more than 9 inches to the chain.

The following table may serve as something to work to :—

For a run of	6	chains,	a fall of	4	inches	to the chain.
"	6½ to 7	"	"	5	"	"
"	7½	"	"	6	"	"
"	8	"	"	7	"	"
"	9	"	"	8	"	"
"	10	"	"	9	"	"

The amount of fall to be given to the water furrows also depends on the capacity of the land for absorbing it. If the soil is loamy, deep, and porous, and easily absorbs a large quantity of water, the fall should be greater than on land which is difficult for the water to penetrate.

In dealing with undulating land where it is difficult to get an even slope from one end of the furrow to the other, care should be taken that the slope at the end remote from the head ditch be not greater than at the end adjoining it, as in Fig. 9.

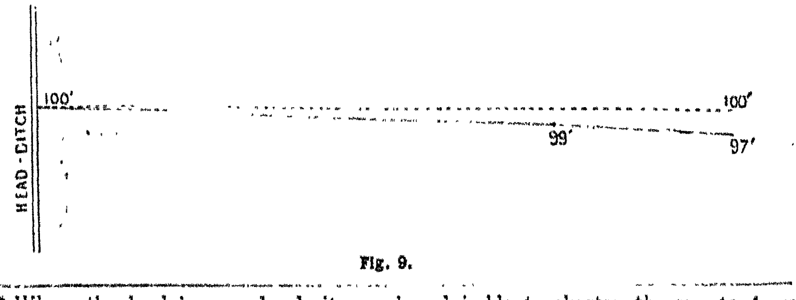


Fig. 9.

* Where the land is very level, it may be advisable to shorten the run to 4 or 5 chains.

On a block where the furrows slope, as shown in Fig. 9, it will be found impossible to give enough water to the land at the end remote from the head ditch, without giving too much to that at the end adjoining it. For where the grade is steeper the water flows more quickly over the surface, and takes longer to saturate the land, than when it is more level; and in this case the water will be flowing slowly over that part of the block near the head ditch, where it will be running for the greater length of time, and quickly over the part remote from it, where it will be running for a shorter period. The consequence will be seepage sooner or later at the end near the head ditch, and the flooding of the property or road beyond the other end of the furrows.

When, on the other hand, the slope of the furrows, though uneven, takes the form shown in Fig. 10, being steeper at the end near the head ditch than

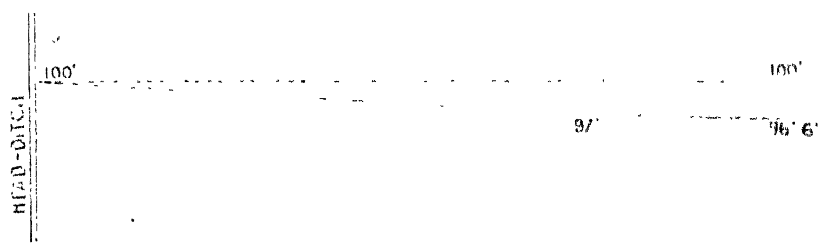


Fig. 10.

at the end remote from it, the water will pass more quickly over the former, where it runs for the greater length of time, than over the latter where it flows for a shorter period, and no difficulty will be found in giving every part of the slope an equal quantity of water.

A farm can often be laid out so that the waste water from the ends of the furrows on one block can be made to flow into the head ditch from which the next block is to be irrigated, and used again. This is a good system, saving as it does both water and labour, and should be put in practice where it is possible.

Where there is a hollow anywhere on a farm, with or without an outlet, the blocks should be so arranged that as few water furrows as possible run directly towards, and end at, the hollow. If the hollow has an outlet, water furrows may run through it in the direction of the outlet, but it will be found that these furrows will require much less water than those on the higher parts of the block, as they will get the soakage from those parts. Where there is no outlet to a hollow, the bottom should be left unirrigated, or nearly so, and though a patch of lucerne may do well enough on the soakage, such a hollow cannot be recommended as a place on which to plant fruit trees.

On undulating land it will usually be found that the rising and falling spurs run more or less parallel to one another, and as *a general rule head-ditches should cross the falling spurs, and the water-furrows should follow them along their length.* On difficult ground this may entail the raising of small

banks to carry over the ditches in places, and even erecting a flume, or taking a ditch round a depression, but the extra expense so incurred will be of small consequence if necessary for the proper laying out of the farm.

It is preferable that all water-furrows, and consequently the rows of trees or vines in a block, should run in the same direction, from one end of the head-ditch to the other, but in country that is at all hilly it is not always possible to have them so without giving too much, or too little, fall to those that proceed from one or other end of the ditch. Wherever it is necessary to change the direction of the water furrows, a headland, between the two sets of rows and parallel to one or other of them, will be needed in order to leave room for cultivation, and short rows will be unavoidable in the angle formed. These short rows should proceed from the head-ditch in the same direction as that set of rows adjoining them which has the least fall, as shown in Fig. 11.

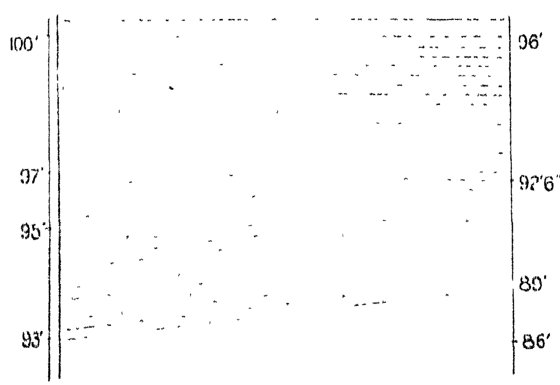


Fig. 11.

It is sometimes possible to place a head ditch so that two blocks may be watered from it, one from each side. This is an economy, especially where concreting is necessary, and is also a convenience when an irrigation is in progress. In such a case the ditch should be made large enough to carry a stream sufficient to water both blocks at the same time, and sluice-boxes should be inserted in each side of it.

It is occasionally necessary to water part of a block from two ditches, one on each side of it, but this should be avoided wherever possible. When it cannot be well avoided, each side of that part of the block should be irrigated separately, and water should never be allowed to flow into both ends of a furrow at the same time, otherwise flooding and breakaways are sure to occur.

It is, of course, desirable that the blocks into which the farm is divided should be regular in shape, that their angles should be right angles, their head-ditches straight, and so on; but these considerations should never weigh against the even distribution of water and convenience in distributing it.

Laying out Land for the Irrigation of Fodder Crops.

There are four differents methods of irrigating lucerne, grasses, and crops, three of them applicable in different and distinct classes of country; and the land must be laid out and prepared according to the method to be adopted.

One of the four is the furrow method, so universally used for irrigating orchards and vineyards, but for fodder crops this method will not be found generally satisfactory, except for maize, sorghum, &c., though it may be made to serve on occasion, when a crop is wanted from land which has not been prepared for one of the other three. The other three methods are:—

(1) Sub-irrigation.
(2) Flooding by means of check-banks.
(3) A modification of the furrow system.

The old method of grading the land into beds or terraces may be dismissed, as it spoils the land and is much too expensive.

(1) *Sub-irrigation* is applicable only in peaty swamp country where the soil is extremely porous and absorbent. Drains are excavated at such intervals that the land between any pair of them filled with water will be capable of becoming saturated by absorption, half of it from each. Water may be regulated to a suitable level in these drains a little below the surface, and the land will absorb such moisture as it requires. Provision must be made, however, for a get-away from the drains, by gravitation or by pumping, as without it the land may become completely flooded by a heavy fall of rain after irrigation.

Sub-irrigation has been found to be the most suitable method for the peaty swamps of the lower Murray.

(2) *Flooding by means of check-banks* is the method to be adopted in flat country which is not porous enough for the practice of sub-irrigation. A careful plan of the levels should be made, and the land divided into one or more series of sections in such a way that no part of a section is more than 2 to 3 inches higher or lower than another part of the same section, and so that the surplus water from any section will drain into the next lower section of the series until the last section is reached. The banks are usually constructed by ploughing about a dozen furrows, and crowding up the earth with a crowder; they should be a foot to 15 inches in height.* The sections should seldom be larger than an acre each in extent, and when a section is being irrigated the water should be let in at different points at the same time, and the surface covered as soon as possible, so that when it is drained off the land may be able to absorb any surplus that may be unavoidably left. Where irrigation by flooding is practised, the water requires more care and attention than where the furrow system is used, and on a farm where part of which is watered by each method, the flooding should be done as far as possible in daylight, and the water turned into the furrows at night.

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* The hollow left alongside the bank should be levelled over after ploughing, if possible.

(3) *A modification of the furrow system.*—Gently undulating land, or slopes where irrigation by means of check-banks would not be practicable, will often grow lucerne or crops just as well as flat country, and will be no more trouble to irrigate if laid out to take the water in shallow permanent courses about 3 feet wide, following the contours, with a fall of from 2 to 4 inches in the chain.

To prepare the land it should first be graded and smoothed in the same way as for fruit-planting under the ordinary furrow system, and, *after grading*, a contour plan prepared from chain-by-chain levels. On this plan the land may be divided into blocks, and head-ditches marked in, in a similar manner to that which would be adopted for the furrow system. Lines should then be marked in on the plan starting from points a chain apart on the head-ditch, and following the contours with a regular fall of from 2 to 4 inches* in the chain, to show the courses to be taken by the water. These lines, when it has been decided that the blocks have been suitably arranged, should be pegged out on the ground with the help of chain and dumpy level and marked, each along its length, with a single plough furrow. A 4-foot disc-harrow, set to throw the earth outwards, is then brought into operation along each furrow, and, taking the courses so formed in pairs, is worked backwards and forwards between each pair, from one to the other, until the whole of the ground is covered with the shallow courses required. On an even slope the courses may be made to run straight and parallel, and where this is possible, the system will be found very suitable for the growing of lucerne and fruit trees together, a practice which has much to recommend it on deep, light, and loamy soils, and which is likely to be extensively adopted in areas where deep and loamy fruit country is available with a water-supply sufficient for lucerne-growing. It is not, however, to be recommended in shallow soils, or where the subsoil is impervious. This subject will be more fully dealt with in a future article.

(*To be continued.*)

* The fall given should be a good deal less than would be given to ordinary water-furrows, because these courses will carry a good deal more water than ordinary furrows, and the water in them will flow more quickly in consequence.

The Use of Soot.

A correspondent asked the Department if finely divided carbon in its pure form had any value as a manure, as from what he could gather, the virtue of soot depended simply on the sulphate of ammonia it contained.

In reply, the Chemist to the Department stated that powdered carbon would not supply plant food to the soil, and the manurial benefit of soot was chiefly due to the ammonium salts. It might, however, be useful, if obtainable cheaply, in lightening stiff clay soils, and the power it had of absorbing gases might be useful in promoting the decomposition of the soil particles by oxygen and carbonic acid, and so increasing the soil's fertility.

Note on the Volatile Fatty Acids of some New South Wales Butters.

A. A. RAMSAY, Assistant Chemist.

THE statement has been made by various authorities that Australian butter is preferred by manufacturers of "process butter," "milk-blended butter," and perhaps, also, "margarine," on account of its high content of volatile fatty acids.

To ascertain if the volatile fatty acids were high in New South Wales butters, and also to add to our knowledge of how the volatile fatty acids in the butter varied with the time of year, a number of determinations of this and of the "iodine absorption" were made.

It was at first intended that butter from certain factories situated in the northern, central, and southern portions of the State should be obtained at regular intervals in Sydney as the butter was being shipped. Owing, however, to a variety of reasons, it was not found possible to do this in its entirety—which is much to be regretted—though a large number of samples were submitted to us. The figures obtained in the course of this work have been tabulated, and are interesting. Though somewhat scrappy and incomplete, these results are thought to be worth making a note of, as a preliminary to a more complete investigation to be undertaken at a future date.

The results of the analyses are set forth in Table I. In making these analyses the Reichart-Wollny figure has been determined by the method as laid down by the Society of Public Analysts,* and the "iodine absorption" by Hübl's method, recommended by Lewkowitsch,† using a time limit of six hours.

The most characteristic feature of butter fat is the presence of fatty acids soluble in water and volatile in steam. The chief of these volatile fatty acids is butyric acid, and the "Reichart-Wollny number," which is the number of cubic centimetres of decinormal alkali required to neutralise the volatile fatty acids, distilled from 5 grains of the butter fat, has been adopted as a measure of the quantity of volatile fatty acids present.

The quantity of volatile fatty acids present in butter varies; feeding, housing, climate, season, and lactation period affect it. Under ordinary conditions of housing and feeding, periods of maximum and minimum amounts are also observed.

Lewkowitsch‡ has collected a number of results representing the "R.-W. number" of butters produced in various countries. These are appended in Table II for the purpose of comparison. The R. W. figure for butter fat usually falls between 24 and 32. The Committee on Butter Regulations, appointed by the Board of Agriculture in England, has recommended that

* The Analyst, XXV, pages 309 to 313.
† Lewkowitsch—Chemical Technology and Analysis of Oils, Fats, and Waxes. Vol. I, page 242.
‡ Lewkowitsch, *loc. cit.* Vol. II, 846–847.

the figures 24, arrived at by the R.-W. method, should be the limit below which a presumption should be raised that butter is not genuine.* France has fixed a minimum limit of 24, Germany 25, Sweden 23, United States 24; Italy, if under 26; Belgium, if under 28.

In reviewing the figures published in Table I, it is to be noted that low figures were obtained in September and high figures in November. The average R.-W. figure of all analyses made is 27·38, which is much above the standard adopted in England (viz., 24), though it is less than the average figure given by Richmond† for English butter, viz., 28·4.

The figures obtained by various workers for "iodine absorption," as stated by Lewkowitsch‡ are as follow:—Hübl, 26 to 35·1; Wollny, 25·7 to 37·9; Thoerner, 28 to 32·0.

The lowest number obtained by us was 33·90 and the highest 43·26. These figures are considerably above the minima and maxima quoted above. Since the time given to the fat and iodine to react on each other affects the results obtained, and since the times given are not stated in the authorities quoted above, it is possible that the determinations were made at less than the six hours time-limit adopted by us, since Lewkowitsch states that under that time the reaction is not complete.

TABLE I.—"Reichart Wollny" and "Iodine Absorption" figures for New South Wales Butters.

	Factory.	April.		May.		September.		October.		November.	
		R.-W.	Iodine.	R.-W.	Iodine.	R.-W.	Iodine.	R.-W.	Iodine.	R.-W.	Iodine.
North	Alstonville ...	26·25	40·02	25·88	42·18	...	...	26·74	43·06	29·29	41·62
	Ballina ...	26·53	37·62	...	...	...	...	...	...	...	...
	Casino ...	...	...	...	...	...	...	29·22	38·50	...	...
	Coraki ...	26·40	37·19	25·53	38·84	...	...	...	...	28·25	41·33
	Gleniffer ...	...	...	...	...	24·58	42·14	...	..	...	...
	Glen Innes ...	...	...	...	...	...	...	...	...	31·10	35·78
	Kyogle ...	...	...	...	...	...	...	...	...	29·12	40·47
	Lismore ...	...	...	...	...	...	...	26·28	43·26	...	...
Average of all North		26·42	38·28	25·71	40·51	24·58	42·14	27·62	41·61	29·44	39·80
Central	Gloucester ...	...	...	...	...	24·84	40·84	...	...	...	...
	Fredericton	...	...	...	...	26·49	41·23	...	...	...	...
	Manning River.	26·70	37·63	25·49	39·86	26·07	40·24	...	...	...	...
	Singleton ...	27·15	37·08	25·94	38·52	...	...	28 65	37·27	28·35	39·65
	Wingham ...	...	...	...	...	24·63	42·37	27·28	42·23	...	...
Average of all Central		26·93	37·37	25·72	39·19	25·51	41·17	27·97	39·75	28·35	39·65
South	Berry ...	27·38	37·75	...	...	...	...	...	...	30·42	34·94
	Bega... ...	28·68	35·70	26·42	37·19	...	...	...	...	29·46	38·36
	Candelo ...	27·55	33·90	...	...	...	...	...	...	...	...
	Cobargo ...	27·49	37·62	...	...	...	...	...	...	...	...
	Mittagong ...	27·06	38·39	...	...	...	...	...	...	31·17	35·90
	Wagga ...	28·51	35·07	...	...	...	...	...	...	...	...
Average of all South		27·78	36·09	26·42	37·19	...	...	...	...	30·35	36·40
Average of all ...		27·25	36·92	25·85	39·32	25·33	41·36	27·75	40·88	29·65	38·51

* Com. on Butter Regulations. Report ed., 1749, 18.
† Richmond. Dairy Chemistry. New edition, page 322.
‡ Lewkowitsch, *loc. cit.* Vol. II, 884.

TABLE II.

Showing maxima and minima of R.-W. figure in Butter from various countries.

Origin of Butter.	R.-W. Figure.	Observer.
English, maximum, 25th March to 24th June	27·2 to 30·0	Veith.
,, minimum, 30th July to 12th Nov.	25·8 to 27·1	,,
,, ...	20·63 to 33·15	Various.
Dutch, maximum in March	33·4	Van Rijn.
,, minimum in November	22·1	,,
Danish, maximum	20·0	
,, minimum	33·0	
Norwegian maximum, August and January..	31·2 and 34·9	
,, minimum, June and March ...	21·1 and 28·6	
German, maximum, April–May	29·9 to 31·0	Veith.
,, minimum, Oct.–Nov.	22·4 to 24·6	,,
Russian, maximum in Feb.	30·5	Petrograd City Laboratory.
,, minimum, April and Nov. ...	20·4 and 21·80	,, ,,
Siberian, maximum, August	30·7	,, ,,
minimum, April	24·0	,, ,,
Swedish	22·9 to 41·0	Nilson.
French	26·1 ,, 30·8	Various.
Belgian	19·8 ,, 36·85	Wanters.
Italian	19·8 ,, 30·14	Various.
Swiss	28·1 ,, 31·1	Ambühl.
American	27·36	Cornwall and Wallace.

THE VALUE OF BROOM MILLET SEED COMPARED WITH SORGHUM.

IN order to ascertain the value of Broom Millet seed, as taken from marketable millet, in comparison with mature Sorghum seed, samples were obtained from the North Coast district, and were submitted to the Chemist's Branch for analysis.

In order to make the comparisons more complete, the results of the analysi of maize are also given.

Constituents.	Mature Sorghum Seed.	Broom Millet Seed.	Bulk Sample, Northern River Maize.
	per cent.	per cent.	per cent.
Moisture	12·42	12·71	11·36
Albuminoids	7·10	9·06	10·06
Ether extract	3·13	2·60	4·57
Nitrogen-free extract (Carbohydrates).	71·34	61·84	71·16
Fibre	3·60	8·53	1·53
Ash	2·41	5·26	1·32
	100·00	100·00	100·00
Albuminoid ratio	1 to 11·4	1 to 7·4	1 to 8
Nutritive value	85·5	76·7	91·5

Cheese Mites.

MATTHEW WALLACE, Dairy Instructor.

To the average consumer of cheese the cheese mite is merely an object of curiosity, though many suppose that it is only to be found on a good cheese.

The cheese-maker has no illusions on the subject, and the presence of mites in his curing-room is regarded with considerable misgiving, and the best means at his disposal are adopted for controlling the pest.

The mites are very small, whitish or colourless, with eight legs, and when once they have attacked cheese, bacon, or flour, they multiply quickly. During summer they increase with astonishing rapidity. They are specifically known as *Tyroglyphus* (formerly *Acarus*) *siro*.

The female brings forth the young alive, and while food lasts and the weather is warm they continue to increase.

It was for a long time difficult to explain what became of the mites when the food supply became exhausted, or how they could possibly spread to isolated places where food was, or how they could find an entrance to new cheese factories.

It has been ascertained that they can fast for weeks, or even months, normally during development: also that there is a natural provision for long fasts and carriage to fresh food supplies, and when about half-grown the cheese mites can change to what is known as the Hypopus or resting stage in their life history.

When the middle-aged mite changes, it becomes hard-skinned and quiescent, and settles down to wait and fast, for several months if necessary, until some day or night a mouse or a fly or some other insect comes along, and the hypopus attaches itself to its body and is thus transferred to fresh food supplies, and at once sets about feeding and breeding.

Though some of the young or adult mites may be similarly carried to fresh food, the majority of them die when their food is finished, but a fair percentage of half-grown or hypopus stage mites stand a good chance of meeting, unexpectedly, new food supplies.

The mites usually make their appearance on cheeses which have been damaged or stored in the room for some considerable time, and though present in large numbers will seldom attack new cheese.

Under ordinary circumstances the damage done by mites is chiefly confined to the unpressed varieties of cheese, which are open in body, and when once the rind is broken it is easy for them to get into the heart of the cheese.

In the case of pressed cheeses which have been well finished and have good rinds, the damage done is, as a rule, small. If, however, a room becomes badly infested, and suitable conditions prevail, such as a warm humid atmosphere, the mites increase so rapidly that considerable attention is necessary to prevent damage being done.

The control of the mites is most difficult where insufficient attention is paid to the finish of the cheese; loose binding or cracked rinds offer little resistance to attack.

The double banking of matured cheeses also gives considerable help to the mites in their efforts to exist, and incidentally damages the cheese.

When once mites have gained a footing in a cheese room, it is practically impossible to get rid of them thoroughly, as is evident from their peculiar life-history, but there are effective measures which may be adopted to keep them in check.

All sheltering uprights, floors, and walls should be kept as clean as possible. If grease from the cheese is allowed to accumulate on the shelving and woodwork, an unfailing store of food is provided for the mites, and they will increase rapidly under such conditions.

Old, damaged or broken cheese should not be allowed to remain in the room, as they are simply a breeding-ground for the pest.

All shelving and woodwork in the cheese-room should be of dressed boards. Such shelves are much easier to clean, and do not offer the same harbourage as the unplaned surface of sawn timber.

Occasionally predaceous mites of a species similar in size and shape appear and destroy *Tyroglyphus* mites, and then they themselves die or are spread to other quarters where their living food is established.

Fumigating the cheese-room with sulphur is an effective means of keeping them under control, but the best results are obtained by systematically washing and scrubbing the shelving, woodwork, and walls with an emulsion of soft soap and kerosene.

The information relating to the life-history and habits of the cheese mite was supplied by Mr. Froggatt, Government Entomologist.

Apples from Bathurst Farm in London.

The Agent General reported recently that included in the "Malwa" shipment was a further small consignment of apples from the Bathurst Experiment Farm. These consisted of Granny Smith, Rome Beauty, and Dunn's Favourite.

"The apples opened up in exceedingly fresh condition. The largest grades showed a little bruise, but not sufficient to greatly militate against their value.

"Granny Smith.—These met with keen competition at auction, and realised from 15s. to 16s. per case.

"Rome Beauty.—Arrived in a sound fresh condition, showing plenty of colour. These realised from 13s. to 14s. per case.

"Dunn's Favourite.—Clean, bright fruit, sound condition; realised 13s. 6d. per case."

The prices mentioned are up to the level obtained for both West Australian and Tasmanian apples consigned by the same vessel, but as neither of the States mentioned forwarded any cases of the three varieties quoted, an exact comparison cannot be made. In all seventeen varieties were submitted, the prices ranging from 11s. to 16s. a case. It will thus be seen that the New South Wales consignment occupied a very favourable position.

Percentage of Husk in Varieties of Oats.

J. T. PRIDHAM, Plant Breeder, and J. O. HEINRICH, B.Sc. (Agr.).

A NUMBER of standard varieties and crossbreds of oats have been grown at the Glen Innes Experiment Farm for the past three years; as this district is pre-eminently suitable for oat production, it was thought that samples from there would be typical of the varieties and suitable for this examination.

One hundred even-sized plump grains of each variety were picked out, carefully husked, and the kernels and husks placed in separate envelopes marked with the name of the oat. These were weighed on a chemical balance, and the weights recorded in grammes.

Sunrise, a sport from Algerian, is the earliest oat of the series to mature. Although Algerian is decidedly more productive for a main crop, for early hay or grain Sunrise is to be preferred. It should be sown rather more thickly than Algerian for best results.

Both Guyra and Cowra No. 18 are varieties resulting from a cross between Algerian and White Ligowo, maturing a little earlier than, and equal in yield to, Algerian in an average season. Kherson, the "Sixty-day" oat of America, has too light a seed for grain-feed purposes, but makes excellent rack hay.

Algerian, the most widely grown of any oat in this State, resembles the Texas Red variety grown in the warmer parts of the United States of America.

Storm King and Tartar King yield grain which has too large a proportion of husk to compare favourably with that of Algerian or Sunrise, and their straw is too coarse and flaggy. The last seven varieties in Table IV ripen too late for any but the coldest districts of New South Wales.

It is expected that the Department will be able to supply small quantities of seed of Sunrise and Guyra next year.

It should be noted that Mr. G. W. Norris, of the Chemist's Branch, did most of the weighings of the 1912 samples, by arrangement with Mr. Guthrie.

TABLE I.—Results for 1912.

Variety.	Plot (1912).	Weight of 100 kernels.	Weight of husks from the 100 kernels.	Total weight, husks and kernels.	Percentage of husks.
		grammes.	grammes.	grammes.	
Sunrise	11 (B)	3·5048	1·3060	4·8108	27·14
Kherson	83 (B)	2·0766	0·7830	2·8596	27·38
Guyra	72 (A)	3·3176	1·2700	4·5876	27·68
Algerian Tartar...	77 (A)	2·5184	1·0866	3·6050	30·14
Cowra No. 18	34 (A)	3·2326	1·4002	4·6328	30·22
Algerian...	48 (B)	3·0186	1·3802	4·3988	31·37
Danish Island	71 (B)	2·1298	1·0370	3·1668	32·74
Algerian x White Tartarian ...	86 (A)	2·4052	1·2424	3·6476	34·06
White Ligowo	9 (B)	2·4040	1·2598	3·6638	34·38
White Tartarian	53 (B)	2·0366	1·1738	3·2104	36·56
Storm King	58 (A)	2·9706	1·7252	4·6958	36·73
Tartar King	78 (B)	2·4186	1·6086	4·0272	39·94
Hutchinson's Potato	76 (B)	2·6478	1·9449	4·5927	42·34

TABLE II.—Results for 1913.

Variety.	Plot (1913).	Weight of 100 kernels.	Weight of husks from the 100 kernels.	Total weight, husks and kernels.	Percentage of husks.
		grammes.	grammes.	grammes.	
White Tartarian	64 (A2)	2·9426	0 8352	3·7778	22·11
Sunrise	81 (A2)	2·9776	1·0002	3·0778	25·14
Abundance	119 (A2)	3·0132	1·0166	4·0298	25·22
Hutchinson's Potato	78 (A2)	3·3254	1·1296	4·4550	25·35
White Ligowo	61 (A1)	3·1325	1·1362	4·2687	26·61
Guyra	14 (A1)	2·8788	1·0554	3·9342	26·82
Kherson	91 (A2)	1·8291	0·7490	2·5781	29·05
Danish Island	72 (A2)	2·5045	1·0672	3·5717	29·88
Bathurst Early	76 (A2)	2·8336	1·2254	4·0590	30·19
Algerian Tartar	24 (A1)	2·2268	0·9994	3·2262	30·98
Ruakura	50 (C)	2·4900	1·1734	3 6634	32·03
Algerian	96 (A2)	2·9270	1·3932	4·3202	32·25
Cowra No. 18	5 (A1)	2·1936	1·0488	3·2424	32·34
Algerian x White Tartarian ...	20 (A1)	1·7818	1·0600	2·8418	37·30

TABLE III.—Results for 1914.

Variety.	Plot (1914).	Weight of 100 kernels.	Weight of husks from the 100 kernels.	Total weight, husks and kernels.	Percentage of husks.
		grammes.	grammes.	grammes.	
Sunrise	Field area.	2·9898	0·9802	3·9700	24·69
Cowra No. 18	43 (B1)	2·7200	0·9868	3·7068	26·62
Kherson	79 (B1)	2·1108	0·7750	2·8858	26·85
Guyra	54 (B1)	2·9846	1·0964	4·0810	26·86
Ruakura	Field area.	2·4114	0·9738	3·3852	28·76
Algerian	75 (B1)	2·7878	1·1662	3·9540	29·49
Hutchinson's Potato	92 (B1)	2 2596	1·1940	3·4536	34·57
White Tartarian	87 (B1)	1·4548	0·8050	2·2598	35·62
Abundance	Field area.	2·8684	1·6100	4·4784	35·95
Danish Island	91 (B1)	1·5986	1·0878	2·6864	40·49
White Ligowo	84 (B1)	1·5658	1·1034	2·6692	41·34

TABLE IV.—Summary of the Three Years' Results.

Variety.	No. of Trials.	Average percentage of husk.
Sunrise...	3	25·65
Guyra	3	27·12
Kherson	3	27·76
Cowra No. 18	3	29·72
Bathurst Early	1	30·19
Ruakura	2	30·39
Algerian Tartar	2	30·56
Abundance	2	30·58
Algerian	3	31·03
White Tartarian	3	31·43
Hutchinson's Potato	3	34·08
White Ligowo	3	34·11
Danish Island	3	34·37
Algerian x White Tartarian ...	2	35·68
Storm King	1	38·73
Tartar King	1	39·04

Tobacco Seed-beds.

C. J. TREGENNA, Tobacco Expert.

IN the growing of tobacco care and trouble are amply repaid in the preparation and subsequent treatment of the seed-beds, and the following notes may suggest to growers some improvements on their present methods.

The last week in August is early enough to start sowings of seed, and this should be continued at regular intervals of a week or ten days up to the first week in November, so that the grower may be assured of a sufficiency of plants whenever the weather is favourable for their removal to the field after danger from frosts is past.

The site chosen for the seed beds should be in a position sheltered from prevailing winds, and the soil should be a well-drained, rich sandy loam. First mark off beds 4 feet wide; then pile a quantity of timber and brushwood on the surface, and start a fire on the leeward side, the intention being to raise sufficient heat to kill insect eggs and seeds of any weeds that may be present. Rubbish of any size should be raked off, but the fine ashes should be left as these will act as a fertiliser when worked into the bed. Then the surface should be broken to a depth of 5 or 6 inches, and worked up to as fine a tilth as possible. The bed should then be enclosed with a framework of wood. If squared timber is not available, straight logs about 6 to 9 inches in diameter will answer the purpose.

One level teaspoonful of seed is sufficient for a bed 4 feet wide and 25 feet long, and should yield enough plants for one acre.

Do not attempt to sow the seed without addition to its bulk, but get two buckets, one of which should be about one-third filled with fine ashes. Place a thin layer of ashes into the empty one, and sprinkle as evenly as possible a pinch of seed over it; add another layer of ashes, and mix well. Repeat the process until the quantity of seed it is wished to sow is used up together with the ashes. Give it a good mixing again with the hands. The early morning will probably be found the best time to sow the seed, before the wind becomes troublesome. It is inadvisable to sow with a strong wind prevailing, if it can possibly be avoided, as the seed is so light that it will be blown away. The mixture of ashes and seed should be distributed over the bed as evenly as possible, and the colour will be a guide as to its evenness. The seed should not be raked in, but after sowing the bed should be gently firmed all over with a piece of flat board. Then lightly water the bed several times with a can having a fine rose. Do not put on so much at one time that it will run in small streams, but moisten the bed thoroughly.

It will now be necessary to cover the beds for protection against cold, the sun, and insects. A simple plan is as follows:—at each end of a bed drive a small post, leaving it about 12 inches above the ground level, and strain a length of No. 10 wire from one to another, and place a few small posts through the centre of the bed to take any sag. Attach to the wire white hessian or cheese-cloth. This may be stitched to the wire tightly with binder twine or string with the aid of a packing needle. The covering should be stretched tight and fastened to the sides by hooking over nails.

As it is advisable to have plenty of plants at the right stage when required, it may be noted that provision should be made for 50 per cent. more beds than are apparently necessary. One hundred square feet of bed is sufficient for an acre, but the bed will require to be pulled over a period of a few weeks, and the grower should not miss an opportunity of getting out as many plants as possible at one time when the weather conditions are favourable. Then, too, the danger from loss of plants by destruction by insects and other causes must not be overlooked. Over a number of years, the grower will find the average of 50 per cent. extra will amply repay him.

If the soil is inclined to pack after sowing, scatter over the bed very lightly some fine well-rotted horse manure. If it is anticipated that the soil is likely to pack in this way the manure should be incorporated in the bed before sowing.

In about one month the beds will be ready to be uncovered, and the seedlings hardened off before transplanting. This should be done gradually. For the first few days, if the weather is very hot, cover up in the middle of the day until the plants can stand the direct heat of the sun.

Plants which come up too thickly in the seed-bed are apt to be weedy and spindly specimens, and should be thinned out so that each occupies an area of about a square inch.

If plants are not coming on as fast as it is wished after they are up, a sugar bag may be filled with horse-manure, the neck tied, and the bag soaked in a cask of 40 gallons of water for a day. The liquid can then be freely used twice a week on the beds with a water-can having a fine rose.

The beds should be covered every evening and left until sunrise. Possibly the grower has not been troubled with the moths which lay eggs on the seedlings and develop into the caterpillars commonly known as "Stem Grubs" or "Tobacco Leaf Miners," and which work their way through the leaf tissues into the stem and stalk, and it is well to take this precaution. If this grub is present, or feared, spray the plants when they have four leaves with two teaspoonsful of arsenate of lead to one gallon of water, and at an interval of four days later repeat the spraying.

Look out for cut-worms, as they work havoc in the beds if left. If their presence is suspected, for two evenings before sowing lay baits on the seed-beds and the surrounding cleared land. The bait is made with: arsenite of soda, 1 lb.; treacle or sugar, 8 lbs.; water, 10 gallons. Dissolve the arsenite

of soda in one pint of boiling water, add the sugar or treacle, and the water, cut up some green stuff and mix together. Pollard also may be used in place of green stuff, and if so, it should be mixed to the consistency of porridge. The quantity mentioned should be enough for the seed-beds for 10 acres of plants.

Possibly it is required to obtain plants quickly, and in the following manner growers may expect to have them ready for transplanting in about six weeks. Before sowing, lightly cover the whole bed (so that it may be plainly seen) with a mixture composed of six parts of high-grade superphosphate, two parts nitrate of potash,* and two parts of bone dust; about 3 or 4 lb. of the mixture will be required for each 100 sq. feet of seed-bed. Take a rake and *lightly* draw it over the bed once, and then sow the seed. When the plants are well up (which should be in about three weeks), soak a sugar-bag full of horse manure in a 40-gallon cask of water, and give the bed a good watering. This should be repeated weekly. Plants so grown will do well in the field, but it must be understood that the grower *cannot* obtain plants quickly if the ground is not warm and the weather spring-like.

Keep the beds moist, but not wet, until the plants are well established. It is important that the beds should never be allowed to become dry on the surface while the seed is germinating. After the plants have reached some size it is better to thoroughly water occasionally—not too often, but *thoroughly* when it is done. This will reduce the danger from mould.

No fixed rule can be given for watering, but do not water beds which are uncovered while the sun is at all strong.

* As nitrate of potash is unobtainable at the present time, except at practically prohibitive rates, its use must be dispensed with.

Stripping and Bulking Tobacco.

C. J. TREGENNA, Tobacco Expert.

So much time and labour has necessarily to be expended by growers before the tobacco leaf is ready for stripping and bulking, that the adoption of correct methods at this stage is a matter of enhanced importance. Yet there are those who quite fail to realise the extent to which the quality may be influenced in the processes of stripping and bulking, and who are consequently disappointed at the eventual refusal of buyers to take the leaf at all, or at the very low price offered. A few suggestions should, therefore, be helpful to growers at this time.

As soon as the stem and stalk of the tobacco have dried, and the atmospheric conditions will permit, the leaves should be stripped from the stalk, and made into "hands." Each hand should consist of twelve leaves, and should be made by binding the stem-butts with a leaf tightly and neatly passed twice around them, and by opening the hand in the centre and pulling the end of the binder through.

When stripping from the stalks, opportunity should be taken to sort the leaves into two classes, No. 1 containing only leaves that are of good bright or yellow colour, and undamaged, and No. 2 containing the leaves that do not show those qualities.

While not necessary with flue-cured tobacco, in the case of leaf that has been air-cured, the hands should be re-hung on the sticks, and given as much sun as possible for a few weeks on a scaffold close to the shed. Care should be taken not to put out more sticks at one time than can be removed to cover at the approach of rain. After each lot of sticks has been "sunned," they should be hung in the shed for a further period of about two months, after which the hands should be bulked down, each in its own class, for some six weeks at the beginning of the warm weather.

Bulking Down.

For bulking the hands, the leaf should not be moist, but in such condition that the tips can be squeezed together without breaking, and that a slight shaking will release one from the other. Opportunity should also be taken of straightening out the hands to improve their appearance before putting into bulk. Leaves with "fat stems" (stems not dried out) should not on any account be included in the bulk, or mould will very quickly appear.

"Bulks" are made by placing two rows of hands, overlapping by about one-third of their length with the butts outward. The height should not be less than 4 feet. The length will be determined by the amount of leaf to be treated. The larger the bulk, the less it will be affected by outside climatic influences.

Growers are advised to cover each bulk as it is completed with blankets or tarpaulins, and to place weights on top, the object being to conserve the heat and moisture, and to avoid the drying out of the leaf. The prime cause of mould is the bulk becoming moistened and chilled, and every precaution should be taken against this. The bulk should be placed on boards well off the ground so that air may circulate freely underneath.

Each bulk should be carefully examined every day, and if one is found to be too warm, it should be broken down, and after each hand has been well shaken and lightly aired, should be rebuilt, those hands which were formerly in the centre being placed on the outside, the outside layers in the centre, and the lower layers on the top.

Leaf that has been through the bulking process satisfactorily shows an absence of gumminess, and also the presence of crystals, which, though minute, can be seen when the leaf is held up to the light.

Poultry Notes.

JAMES HADLINGTON, Poultry Expert.

AUGUST.

THE hatching season is now in full swing, and especial care must be given to the breeding pens from which the eggs for hatching are taken. Careful feeding is essential, particular attention being paid to the male bird to see that in his gallantry he is not depriving himself of his share of the food. Should this occur, separate feeding is the only remedy.

If the thinning-out that has been necessary in many flocks during the recent period of feed scarcity has been rightly directed, and the undesirables weeded out to the extent that should have been the case, a material improvement in the stock left to breed from will be the result, and a correspondingly better crop of chickens should be obtained this season.

Looking Ahead.

Adequate preparation for the number of chickens to be hatched is absolutely necessary to successful rearing, and ample provision should be made for the number that it is intended to hatch. It is one thing to hatch a large number of chickens, but it is quite another to rear them successfully. Failure to provide either ample brooder accommodation, or hens for brooding, is sure to result in disappointment, much loss of chicken life, and a waste of valuable time. It is far better to aim at a small number of chickens hatched at the right time and well reared, than a large quantity badly reared, or perhaps for the most part not reared at all. Only good well-grown chickens can prove satisfactory layers, or make prime table poultry, which will profitably respond to the feed expended upon them, particularly in a time of dear feed like the present. It therefore follows, that more than ever the aim should be to secure good chickens, well reared, even if there are fewer of them.

The requirement in brooders can be easily estimated, based upon the hatching capacity. It should be calculated that about seven to eight brooders each of 100-capacity will be required to meet a hatching output of 100 per week, remembering that the 100-capacity brooder is only suitable for that number for about eight to ten days. Extra brooder room will, therefore, be required when the chickens are thinned out as they increase in size, hence the number mentioned. This is based on keeping the chickens under heat more or less up to five or six weeks old. If brooders of 50-capacity only are used, it follows that double that number will be required.

This is a matter which is too often lost sight of at the commencement of the hatching season; more chickens are hatched than proper provision has been made for, and disaster occurs from attempting to run too many in each brooder. True, many operators get through with less accommodation than is here outlined, but at a cost of much labour, and where a few succeed many fail. The wastage in chicken life every season from such failures is something almost tragic, not to mention the loss and disappointment, and it is noticeable

that operators are more disposed to look for the cause of their failure in disease or in some abstruse scientific explanation, than to the simple fact that crowding too many chickens into the brooders is in most cases the basic cause of the trouble.

Brooder Accommodation.

The size of the brooder is a matter of the first importance; many brooders of a reputed capacity of 100 chickens are as a matter of fact not large enough to accommodate half that number. A good size for a 100-capacity brooder is 8 square feet of floor space, and the brooder is better oblong in shape than square, a serviceable size being 4 feet by 2 feet. A fair height should also be given; 12 to 14 inches is not too much. This size will accommodate 100 chickens for the first week or ten days, but it will be the more successful if run with only seventy-five. These should be thinned down, so that at the end of three weeks not more than sixty are left in, and fewer still as they increase in size.

Brooding Chickens with Hens.

Brooding chickens with hens is much preferable to using a doubtful class of brooder. Quite a large number of chickens can be brooded with hens in a season if properly handled. Six good broody hens may be given 100 chickens from an incubator, allotting sixteen to eighteen to each hen. But attempts to run a lot of hens with chickens together in one flock, as is sometimes seen, generally ends in failure and the loss of many chickens, from the same cause as that leading to failure with the brooders. In such cases, instead of each hen brooding her own quota of chickens, it will generally be found that one or two hens, being the best mothers, attract the bulk of the chickens to them. These hens usually back into corners to enable them to cover the chickens more effectually, while other hens squat about in different places covering a few chickens each. As this happens principally at night, it is often unnoticed by the attendants, and the chickens gradually die off or get diseased from the effects of overcrowding in some cases, and insufficient warmth in others. It is not realised that when a hen has thirty or forty chickens, overcrowding must be taking place, nevertheless it is so, and the same consequences follow as would be the case in a brooder with too many in, or when run at too low a temperature.

When hens are not used for hatching the eggs, but are required to brood the chickens coming from incubators, there is no necessity that the hens should be set more than two or three days previous to being required to take the chickens. The method of procedure in this case is that, as hens are found broody they can be set in the usual way with only two or three eggs under them; these will keep them to the nest until wanted. (Infertile eggs that have been tested out of the incubator will answer for this purpose.) As soon as the eggs in the incubator commence to chip, one or two chipped eggs are taken to each hen and substituted for the eggs already under her. By this means the hen will become accustomed to the chirp of the chicken as it emerges from the shell, and will then be ready to take any number it is desired to give her. Putting the remainder of the chickens under the hen

should not be long delayed, or the hen will become so accustomed to the one or two chickens that she may not take more. In such cases the individuality of the hen is a factor to be considered. To ensure success in transferring the chickens, the hens should be confined to the nest and kept darkened until the whole of the batch has been given her; she is also best confined to the nest for a day after. Provision should of course be made for her feed and water. On the second day the hens should be removed to coops or boxes with slatted fronts, and placed in convenient positions under a shed or shelter of some kind, unless the coops are weather-proof; of course shade will be necessary. In this system the hens are kept confined to the coops, and the chickens allowed to run at large, their ingress being between the slats in front of the coop.

A still better method is to put in front of each coop a small wire-netting run 3 or 4 feet long, the bottom of which can be raised to allow the chickens to pass under. These runs are, however, not absolutely necessary. This plan works best with chickens of one colour and uniform age, run in one section of the breeding ground, because colours and different sizes are easily recognised by the hens, and almost any hen will peck at, and sometimes kill, chickens of a size or colour different to her own. The chickens will invariably go back to their own coops at night, but the troubles referred to occur in the day time. In cases where hens are put in close proximity to each other, it will be well to keep a watch on the coops at night to see that too many have not drifted to one hen. When chickens of different colours are to be put close together it will be well to distribute the different colours among all the hens.

To ensure freedom from vermin the hens should first be dusted with insecticide and set in clean nests, and away from contact with vermin.

The Feed Problem.

There is now every prospect that wheat will be readily procurable, though inevitably at a high price. But it is by no means certain that pollard and bran will be available in sufficient quantity to meet all requirements in the immediate future. Should this prove to be the case, doubtless wheatmeal will be on the market more extensively than hitherto, or, as an alternative, poultry-farmers may be able to get wheat gristed at local mills now that wheat is available.

In anticipation of this, it may be mentioned that wheatmeal can be extensively used in place of the combined pollard and bran portions of the usual ration, and particularly in conjunction with oilcake and lucerne dust, or lucerne chaff. These will materially assist in counteracting the sticky nature of the wheatmeal, and make the mash of a more suitable consistency than would be possible with wheatmeal alone, which would be extremely doughy. Wheatmeal may be used to take the place of the combined portions of pollard and bran given in the formulæ for the morning mash referred to in the June issue of these notes. As a simple formula the following is suggested:—Wheatmeal 50 lb., cocoa-nut oil cake 15 lb., lucerne dust or chaff 30 lb., meat-meal, 5 lb., salt 22 oz.

Agricultural Bureau of New South Wales.

NOTES COMPILED BY H. ROSS, Chief Inspector.

Branch.	Honorary Secretary.
Albury	Mr. J. Brann, "Silvania," Racecourse Road, Albury.
Baan Baa	Mr. P. Gilbert, Baan Baa.
Balldale	Mr. H. Elrington, Balldale.
Bathurst	Mr. J. McIntyre, Orton Park.
Batlow	Mr. L. S. Chandler, Batlow.
Beckom	Mr. Peter Grant, Beckom.
Bimbaya	Mr. E. T. Boller, Bimbaya.
Blacktown	Mr. Robert H. Lalor, P.O., Seven Hills.
Bloom Hill (O'Connell) ...	Mr. C. A. McAlister, Bloom Hill, O'Connell.
Borambil	Mr. H. A. D. Crossman, "Homewood," Quirindi.
Bungalong	Mr. G. H. Pereira, "Springdale," Cowra Road, *via* Cowra.
Canadian	Mr. F. W. Taylor, Public School, Canadian Lead.
Cardiff	Mr. John Cockburn, Cardiff.
Carlingford	Mr. D. K. Otton, Carlingford.
Cattai	Mr. A. J. McDonald, Cattai, Pitt Town.
Cobbora	Mr. Robert Thomson, Cobbora.
Collie	Mr. C. J. Rowcliff, Cow Plain, Collie.
Coobang	Mr. Benno Seidel "Clear View," Coobang, *via* Parkes.
Coonabarabran	Mr. H. H. Moss, Coonabarabran.
Coradgery	Mr. J. Clatworthy, Beechmore, Millpose, Parkes.
Coraki	Mr. G. E. Ardill, Bungawalbyn.
Coreen-Burraja	Mr. N. B. Alston, Coreen, *via* Corowa.
Courangra	Mr. S. H. Warland, Courangra, *via* Brooklyn.
Cowra	Mr. E. P. Todhunter, Cowra.
Crudine	Mr. F. W. Clarke, Crudine.
Cundletown	Mr. S. A. Levick, Roseneath, Cundletown.
Cundumbul and Eurimbla	Mr. J. D. Berney, Eurimbla, *via* Cumnock.
Deniliquin	Mr. W. J. Adams, jun., Deniliquin.
Derrain	Mr. A. P. Hunter, Red Bank Creek, Matong.
Dubbo	Mr. T. A. Nicholas, Dubbo.
Dunedoo	Mr. V. A. Florance (*pro tem*), Dunedoo.
Erudgere	Mr. Frank Hughes, Erudgere.
Fairfield	Mr. H. P. Godfrey, Hamilton Road, Fairfield West.
Fernbrook	Mr. W. Marks, Yarrum Creek, Dorrigo.
Forest Creek	Mr. W. Thompson, Forest Creek, Frogmore.
Garra and Pinecliff ...	Mr. A. S. Blackwood, "Netherton," Garra, *via* Pinecliff.
Gerringong	Mr. J. Miller, Gerringong.
Grenfell	Mr. G. Cousins, Grenfell.
Gunning	Mr. E. H. Turner, Gunning.
Hay...	Mr. F. Headon, Booligal Road, Hay.
Henty	Mr. L. Eulenstein, Henty.
Hillston	Mr. M. Knechtli, Hillston.
Inverell	Mr. W. A. Kook, Rock Mount, Inverell.
Jerrara	Mr. A. O. Lane, Public School, Mullengrove, Wheeo.
Jindabyne	Mr. Sylvester Kennedy, Jindabyne
Katoomba	Mr. W. E. Perry, Victoria Road, Katoomba.
Keepit, Manilla	Mr. J. B. Fitzgerald, Keepit, *via* Manilla.
Kellyville	Mr. Joseph Nutter, Kellyville.
Kenthurst	Mr. J. R. Jones, Kenthurst.
Lankey's Creek (Jingellic)	Mr. G. J. Nichols, P.O., Jingellic.
Leech's Gully	Mr. J. T. Weir, Tenterfield.
Leeton	Mr. A. V. Roux, P.O., Leeton.
Little Plain	Mr. F. S. Stening, Little Plain, *via* Inverell.
Lower Portland	Mr. W. C. Gambrill, Lower Portland.
Mangrove Mountain ...	Mr. A. E. Lillicrapp, Mangrove Mountain, *via* Gosford.
Martin's Creek	Mr. P. Laney, Martin's Creek, *via* Paterson.
Meadow Flat	Mr. F. J. Brown, "The Poplars," Meadow Flat, *via* Rydal.

Branch.	Honorary Secretary.
Middle Dural	Mr. A. E. Best, "Ellicsleigh," Middle Dural
Milbrulong	Mr. O. Ludwig, Milbrulong.
Miller's Forest	Mr. A. J. O'Brien, Miller's Forest.
Mittagong	Mr. C. Dunlop, No. 7 Farm Home, Mittagong.
Moruya	Mr. P. Flynn, Moruya.
Narellan	Mr. G. J. Richardson, Narellan.
Narrandera	Mr. James Falkner, Narrandera.
Nelson's Plains	Mr. M. Cunningham, Nelson's Plains
Nimbin	Mr. J. T. Hutchinson, Nimbin.
Orangeville	Mr. C. Duck, Orangeville, The Oaks
Orchard Hills (Penrith) ...	Mr. H. Basedow, Orchard Hills, *via* Penrith.
Parkesbourne	Mr. W. H. Weatherstone, Parkesbourne.
Peak Hill	Mr. A. B. Pettigrew, Peak Hill.
Penrose-Kareela	Mr. A. J. Bennett, "Brookvale," Kareela.
Ponto	Mr. A. D. Dunkley, Ponto.
Pyangle (Lue)	Mr. T. A. Sheridan, Homestead, Lue.
Redbank	Mr. J. J. Cunningham, Redbank, Laggan.
Ringwood	Mr. Wm. Tait, Ringwood.
Robert's Creek	Mr. J. Cavanagh, Robert's Creek.
St. Mary's	Mr. W. Morris, Queen and Victoria Streets, St. Mary's.
Sackville	Mr. Arthur Manning, Sackville.
Sherwood	Mr. J. E. Davis, Sherwood.
Stockinbingal	Mr. J. Neville, Stockinbingal.
St. John's Park	Mr. J. O. Scott, St. John's Park.
Tallawang	Mr. Selwyn E. Hinder, Tallawang.
Tangmangaroo	Mr. A. Thompson, Public School, Kangiara Mines.
Taralga	Mr. Dave Mullaney, Stonequarry, Taralga.
Tatham	Mr. J. J. Riley, Tatham.
Temora	Mr. J. T. Warren, "Mortlake," Victoria-street, Temora.
Toronto	Mr. P. F. Newman, Toronto.
Tumbarumba	Mr. R. Livingstone, Tumbarumba.
United Peel River (Woolomin).	Mr. C. J. MacRae, Woolomin.
Upper Belmore River ...	Mr. M. H. Hodgson, Upper Belmore River, *via* Gladstone, Macleay River.
Uralla	Mr. E. A. Neil, Uralla.
Valla	Mr. A. E. T. Reynolds, Valla, *via* Bowraville.
Wagga	Mr. Thos. Fraser, Aberfeldie, Wagga.
Walla Walla	Mr. B. A. Smith, Walla Walla.
Wallendbeen	Mr. W. J. Cartwright, Wallendbeen.
Walli	Mr. Geo. Edgerton, Applewood, Walli.
Wetherill Park	Mr. L. Rainbow, Wetherill Park.
Wollun	————
Wolseley Park	Mr. H. McEachern, Wolseley Park.
Wyan	Mr. C. W. Harper, Myrtle Creek Railway Station.
Wyong	Mr. Edgar J. Johns, Wyong.
Yass	————
Yetholme	Mr. N. D. Graham, "Bona Dea," Yetholme.
Yurrunga and Avoca ...	Mr. W. H. Waters, Yurrunga.

Notice to Honorary Secretaries.

It is important that a record of the meetings of the branches should be inserted in the *Agricultural Gazette*, and honorary secretaries are invited to forward to the Department a short account of the proceedings of each meeting, with a brief summary of any paper which may have been read, and the discussion that followed it, as early as possible after each meeting. Notes for insertion in the *Agricultural Gazette* must reach the Department before the 16th to ensure insertion in the following month's issue.

Insect Pests.—Quite a number of the branches have availed themselves of the Department's offer to supply a set of insects, being the common pests of the district, and the collections are now being cased. The Government

Entomologist suggests that as each district has certain pests peculiar to its orchards and gardens, more useful work would be done if the members themselves collected the local pests (orchard, garden, and stock) and sent them to the Department, where they would be arranged, mounted, a descriptive label attached, and returned to the branch. Mr. Froggatt considers that such a collection would have a far greater value, as there would be more interest attached to the specimens when the members knew exactly where the pests came from, and where and how to find them.

Sheaves of Grasses.—The Department is prepared to supply to branches of the Bureau which make application through their secretaries, collections of sheaves of grasses considered suitable for the respective local conditions.

Organisation of Branches.

An officer (Mr. A. M. Makinson) has been appointed especially to attend to the needs of branches of the Agricultural Bureau, and generally to organise this movement.

He will visit in turn every branch throughout the State, and confer with the Secretaries and members as to future operations, &c.

Secretaries will be advised in due course when this officer will pay a visit to their respective districts.

Demonstrations in Clearing Land and Subsoiling with Explosives

A limited number of demonstrations in clearing land and subsoiling with explosives will be given by Mr. C. W. Burrows, Assistant Inspector of Agriculture, to branches of the Agricultural Bureau. Branches who wish to take advantage of this offer are requested to make early application to the Department through their honorary secretaries.

Bee-keeping.

A series of lectures on bee-keeping is being arranged by Mr. R. G. Warry, Instructor in Apiculture. Secretaries, whose branches intend availing themselves of this opportunity to receive a practical insight into this branch of agriculture, are requested to make early application.

REPORTS AND NOTICES FROM BRANCHES.

NOTE.—*While gladly publishing in these columns the views of members of the various Branches of the Agricultural Bureau, it is pointed out that the Department does not necessarily endorse all the opinions expressed.*

Batlow.

The following is a condensation of a paper read by Mr. H. W. Cabban at the May meeting of the above branch.

Fruit-growing at Batlow.

In giving my views on this subject, I desire to state that my experience has only covered a period of six years, and while dealing with the question from actual experiences and general knowledge, a greater time is necessary to get a thorough grip of the growth and peculiarities of certain trees.

When one commences the preparations for an orchard, he must have as his objective the creation of what is to be a life-time crop, and in this essential there is a wide difference between an annual cropping of, say, wheat, and the permanent results that are looked for in the cultivation of trees. If agriculture, in the ordinary sense, should be thorough, how much more thorough should be arboriculture?

Preparation of Ground.—The ground should be ploughed to a depth of at least 9 inches to 12 inches or even deeper—mere scratching of the surface is not enough. Rubbish, that is, roots, &c., should be cleared off and burnt, for the presence of roots in the soil encourages disease, particularly *Armillaria mellea*. Shallow ploughing may produce reasonably good results in good years, but to ensure satisfactory returns regularly and for all time, and with the rainfall sometimes below normal, deep work is absolutely essential to success. To reduce the possibility of disease on new ground—and this is a factor worth due consideration —it is advisable to defer the planting of trees till the second year after the preparation of the virgin soil, in the meantime employing the land by cropping potatoes. It may be accepted as a general rule that such methods will get rid of any disease peculiar to that particular variety of soil, and the only thing against it is that the orchard will be delayed a year in reaching full bearing capacity, but the results will more than compensate for what, at first thought, might appear a waste of time.

The planting of trees in virgin or new soil is a simple matter, but it is quite another matter with old ground. Continual ploughing, particularly by the new American ploughs, has a tendency to harden the soil immediately above the subsoil, and a hard-pan is formed, which interferes with the free movement of the moisture that is so essential to the well-being of the trees. Dynamiting is of inestimable value here, as it breaks up the pan referred to, and allows free access of air and moisture.

Low ground should be drained, and in this work particular care is necessary to notice the springs, as in this soil one can go within a foot of a spring without tapping it, and the water will still rise to the surface. Every small spring should be tapped to make a success of draining. A drain 3 feet 6 inches in depth is sufficient ; it should be roughly filled in with about 15 inches to 18 inches of stone, using small stone to finish off. It is not advisable to use bushes at all in covering the stones.

Laying-out.—Appearance and accessibility for working are the main features for consideration in pegging out the land. The two general methods—the square and the equilateral triangle—may each be backed up by solid arguments. I am inclined to believe that the results looked for from the triangular method are secured also by the square method. The distance between the trees generally adopted in this district has been 25 feet, but I have reduced it in my orchard to 23 feet, with quite satisfactory results, and particularly in the cases of pears and plums. I believe 20 feet is quite ample, and would not hesitate to adopt it in future.

On receipt of the trees from the nursery, it is well to bury them in their bundles for several weeks, to prevent exposure of the roots and to revive the trees generally.

Planting.—The planting is important. All broken roots should be removed, and all roots cut back in a slanting fashion, at an angle of about 45 degrees, so as to ensure the secure setting of the roots on the soil. This is essential if quick growths are looked for, and, of course, immediate growth is valuable. In planting the trees have a little rise in the centre of the hole to set the tree on, train the roots downward, fill in the soil, and when doing so pull the surface roots or feeders up, spread them out over the other roots, cover them with more soil, and tread the earth round the tree, treading lighter near the butt, and heavier towards the ends of the roots. This will cause the roots to shoot downwards. In planting on the hill side, trees need to be put in about 2 inches deeper than on level land, as the soil keeps working away on hilly land. July is the best month for planting.

Pruning.—Up to the fourth year trees should be cut back fairly hard, and fruit should not be looked for. The aim should be rather to form a substantial tree with a good base. The development of forks should be guarded against, and the young trees should be trained with three leaders. This is more important perhaps in the case of the King David apple and several varieties of pears. After the fourth year the pruning may be lighter, and with greater liberty of opinion as to the number of leaders. It is simple enough to remove a leader if they become too numerous. This treatment will apply to cherries, pears, prunes, and apples.

The peculiarity of Rome Beauty, which comes into bearing as a four-year old, is the blind bud. Every two or three years cut back the laterals to the blind bud, and a fresh supply of laterals will be obtained. Leaders may also be brought back to the blind bud, and will shoot again strongly.

King David requires similar treatment to Jonathan, with the exception that the leaders should be shortened well back to avoid the tendency on their part to bend and break under their load of fruit. It is a regular and continuous cropper, but, like Cleopatra, it is prone to Bitter Pit in a light crop ; this, however, often disappears as the tree ages and reaches full bearing.

Cleopatra is supposed to be subject to woolly aphis, but my three trees are doing well, and appear to be losing the Bitter Pit as they mature. They are good croppers ; two

are set on high ground and one on low; and I believe it is desirable that growers should cultivate this apple more extensively. One hundred trees will certainly not be too many.

Sturmer Pippin may be recommended for this district, and should be treated similarly to London Pippin.

Jonathan I treat by alternate light and heavy prunings. The former method produces abundant fruit buds, and the latter preserves the shape of the tree. A yearly crop is thus obtained. In treating laterals shorten some back and allow others to go for two or three years, or cut out altogether, for other laterals are coming on, the object being to prevent Bitter Pit. Provided always that the branches are not in the way of the harrows or cultivator, no summer pruning is required.

On London Pippin (Five Crown) the laterals may be allowed to go, but the leaders should be cut back about the same length each year. Late in the spring cut back the laterals, and destroy the cuttings to prevent the spread of mildew. I know of no treatment that will alter the apparent nature of this variety as an alternate bearer, though summer pruning is beneficial.

Late pruning of Silver Prune cost me, in 1913, the loss of many good trees. Late in the winter sap is rising and the tree is at the mercy of the frost, however light. On the other hand, if pruning is done early the sap is set and a crust is formed that acts as a protection against the frost. I advise, therefore, early pruning, for I have proved that there is then much less danger of losing trees. For the same reason care should be taken when ploughing in spring lest a tree be bruised, and the frost given the opening to attack the tree, just as in the case of late pruning. I know of no way of saving the tree from gumming. The quickest cure is to remove and replace it with another tree. Open the hole and apply two buckets of lime, mixing it thoroughly with the soil. In a suitable year, drying will give good results with this plum, but generally canning is safer and more remunerative.

Williams' is the best commercial pear. It is very hardy, and requires much cutting back and summer pruning. Laterals may be cut back to 2 inches. In letting the laterals go, the buds (eight to ten) at the end remain strong, while those below are weak and more like blind buds. This does not apply to leaders, which form buds all the way up. If lightly pruned for one year the buds will set, and may then be cut into heavily.

Winter Cole pear has a strong tendency to grow straight up. The remedies are—(*a*) to cut the tree fairly hard the first four years, and then to cut leaders long so as to force them out by their own weight and the weight of fruit; (*b*) to cut to the inside bud, that is, to the top bud or the bud above that which it is desired to keep. Give plenty of summer pruning.

Josephine de Malines requires light pruning from the fourth to sixth year. It might with advantage even be left untouched for one year at that time. Laterals may be left two years, but leaders must be cut back to form a base when the tree is bearing. Summer pruning is more beneficial than winter pruning. This tree may be pruned when in fruit, and should be summer pruned freely.

Judging from results of the few I have growing, P. Barry is not suitable to this district, and I cannot advise their culture here.

Packham's Triumph is a pear that must not be pruned during summer, as you can get all the necessary fruit buds from winter pruning. If the leaders are made too strong they will fall out of shape, willow-like, and so spoil the shape of the tree for next pruning.

Interpollination.—This is the main feature of orchard growing. A well fertilised tree withstands frost to a great extent. Different varieties should be planted every two or three rows. Plums, apples, cherries, and pears require treatment in this way. In ordinary circumstances the bush bees will help in interpollination, but every orchardist should also be, to some extent, an apiarist.

The following is a list of varieties of apples that bloom together at Batlow:

Early Blossoming.—Jonathan, Newtown Pippin, Bismarck, Cleopatra, Dunn's Favourite, Gravenstein, King David, Pomme de Neige, Sturmer, Yates, Cox's Orange Pippin, Delicious, Esopus Spitzenburg, Reinette de Canada, Rokewood, Rymer, Dougherty, Stone Pippin, James Grieves, McIntosh Red, Senator, Trivett.

Late Blossoming.—London Pippin (Five Crown), Hoover, Majetin, Rome Beauty, Northern Spy, Scarlet Pearmain.

Breakwinds.—These are very necessary in fruit growing. Walnuts are the most profitable, and they should be planted from 30 feet to 40 feet apart. In this district the ground needs to be well trenched before planting, because of the heavy nature of the soil. No fruit-bearing tree will adapt itself to the varying conditions of the climate better than the walnut, and any moderately good land will prove suitable. If necessary the soil must be drained. Young trees should receive careful attention in the way of pruning during the first few years, so as to ensure well formed heads as soon as possible. In later years all that is necessary is to thin out the branches when they are too much crowded. Remove rank or misplaced shoots and shorten back growth when required.

Walnut trees are not liable to many diseases. Dwarf Prolific is a good variety, as it comes into bearing when quite young.

Spraying.—Miscible red oils are not dangerous if properly used. Leave about a gallon of the spray mixture in the bottom of the cask, so that the free oil may float, and not go through the pump. This can be conserved and used later. When the sun is very hot, miscible red oils are dangerous. Spray early in winter before the aphides go into winter quarters, and if necessary spray again before they emerge in the spring—about the time the buds are swelling. A spray with a good strong pressure should be used.

Miscible red oils for red spider have not succeeded with me, and lime-sulphur will have to be used. It is not advisable to spray cherries and prunes with red oils for the reason that these trees are more tender than apples and pears.

I have tried several commercial brands of arsenate of lead, and have had good results.

For woolly aphis a pretty strong mixture of tobacco wash is required, or else it is ineffective. I use 50 lb. tobacco stems, 6 lb. soft soap, 6 lb. molasses to 100 gallons of water. The tobacco stems require soaking for about twelve hours in hot water which should not be allowed to boil; the soft soap should be dissolved separately in boiling water, and then added to the tobacco wash, which in the meantime has been thoroughly strained. Then add the molasses, and stir thoroughly. The soap should never be dissolved with the tobacco wash or molasses. A thick greasy scum is formed, which clogs the valves of the pump, strainers, and nozzles. Great care should be taken in the straining of the mixture, or there will be trouble. Always strain twice. Some trouble may be found in maintaining a regular supply of liquid, and a 400 to 600-gallon boiler is required in which to soak the stems, a bale at a time (about 3½ cwt.), and then dilute down to required strength. I would not recommend spraying trees on which the fruit was within a month, say, of ripening, as the spray stains rather badly, though it has no other ill-effect on the fruit or foliage. It is preferable to put the spray on lukewarm, as it penetrates better; a medium nozzle is better than a fine one, as it gives a more driving spray.

Picking.—In picking London Pippin it is not necessary to wait till the fruit is well coloured, for there is then a risk of the apples catching a shower of rain, and the absorption of water reduces the carrying value of the fruit. Pick, therefore, when matured to a good size and not too large. For the first picking, about the middle of March, make a tour among the trees, and choose apples well matured and of similar size. The smaller apples will have a chance of maturing. In summarising the advantages of early picking, I should take three points—(*a*) it saves fruit from depredation by birds; (*b*) the fruit keeps better; and (c) it carries better and does not lose flavour.

Jonathan should be picked a week or fortnight earlier than London Pippin, selecting the largest and best coloured first. Leave King David a little longer than either of the foregoing if a good colour is required. Pick Granny Smith and Rome Beauty in April.

Williams pear should be observed carefully, and the first to ripen picked when of matured size and without waiting for the seed to brown. Others will come in better as a result of this thinning out. Leave Josephine de Malines as late as possible, and P. Barry till the end of May.

Packing.—Every orchardist should be conversant with the Fruit Cases Act, which was passed for our benefit. Only new and clean boxes should be used, and the Act complied with in all respects, so as to guard against the spreading of diseases. The advertisement attached to clean fruit cases and method of packing should also be kept in view. Every case should be lined with white paper and every apple wrapped. When sending hard green Williams pears do not wrap them, as they then ripen too quickly; only wrap them if on the ripe side.

Budding.—There are periods when the flow of sap is checked, and the bark holds tightly to the wood. This is especially noticeable during a long, dry spell. At such times budding should not be attempted. Still, moist warm weather is most suitable. Dry weather with a fiery sun is likely to kill the buds, unless protection is provided; rainy weather is also injurious to buds. The "T" method is generally adopted. When operating, the shoots containing the buds should be taken and two-thirds of the leaf from each bud removed, in order to prevent a too rapid transpiration. They are then placed in a wet cloth or fine bagging. Shoots treated in this manner do not wilt or become too dry for use for a considerable time.

In binding, use soft twine or cheap calico; do not tie tightly, as a free circulation of the sap stream is essential. In removing the wood from the bud, care should be exercised so that the core is not removed. The operation, to be successful, must be done quickly, for the tissue is very delicate and sensitive, and soon becomes vitiated or spoilt if exposed to the air for more than a few moments. As soon as it is known that the buds have taken, the ties should be loosened and seen to occasionally; in about six weeks or two months they may be removed altogether. I consider January the best month for budding.

Beckom.

At the June meeting of this branch members discussed the noxious weeds of the district. Amongst those mentioned were Chinese Thistle, Wild Tobacco, Mustard, and Summer Weed.

Bimbaya.

A branch has been established at Bimbaya in the Candelo district, with twenty-two members to commence.

The following gentlemen have been elected as office-bearers:—Chairman, Mr. T. Heffernan; Vice-Chairmen, Messrs. E. H. Filmer and George Alcock; Treasurer, Mr. T. J. Glenn; Hon. Secretary, Mr. E. T. Boller. The subscription has been fixed at 2s. per annum.

At a meeting held on 7th July, a discussion took place regarding the partial disappearance of White Clover from this portion of the district.

Mr. T. Heffernan expressed the opinion that the clover had not partially died out, but was still in the ground in abundance. He instanced seasons when not only the flats, but also the hills, were white with clover. These so-called "clover years" seemed to be followed by years when the plant grew scantily, notwithstanding that a considerable quantity of seed must have fallen. Mr. Heffernan held the opinion that, without re-sowing, clover would again be seen growing in profusion when a season arrived that was favourable for its growth.

A discussion also arose regarding the use of grub-infested potatoes for seed. It was stated that almost all the local seed was more or less affected, and farmers lacked knowledge as to the best means of cleaning it, and of keeping the growing crop free from disease. It was also said the grub was confounded with the eel-worm, not a few holding the opinion that it came out of the soil, and that as it was now in the district it would attack each season's crop more or less seriously.

DEPARTMENTAL NOTE.—The foregoing paragraph apparently refers to the Potato Moth. The seed may have been affected, and it will be found that the larvæ have now left the tubers. It must be remembered that the larval stage is only one stage in the life of the insect, and it would still require to pass through the chrysalis, moth, and egg stage before it could again cause damage. The pest has been present with us for a number of years, but it is really only on the occasion of dry spells that its presence is marked.

Blacktown.

The regular monthly meeting was held on 6th July. Mr. George Lalor (Vice-Chairman) presided.

The directions regarding planting of trees, previously requested by the branch, were received from the Department of Agriculture and discussed.

It was resolved to accept the offer from the Water Conservation and Irrigation Commission of a lantern lecture at Blacktown during August or September.

The Secretary reported having been visited by Mr. A. M. Makinson, Organising Inspector of the Agricultural Bureau.

Carlingford.

The annual meeting of this branch was held on 4th June, when a report was read by the Secretary, which showed that ten meetings and one demonstration had been held during the year. Appreciation was expressed of the lectures delivered by Mr. Hadlington and Mr. H. Lord, and of the pruning demonstration given by Mr. J. G. R. Bryant. The suggestion was also made in the report that the branch should not neglect the interests of the cottage gardeners, who were multiplying in the district, but should encourage them to control weeds and the pests and diseases of fruit trees.

Coobang.

A new branch has been established at Coobang, *via* Parkes, which gives promise of being a very successful one.

The election of office-bearers resulted as follows:—Chairman, Mr. W. Annison; Vice-Chairman, Mr. E. Jelbart; Treasurer, Mr. H. E. Drabsch; Hon. Secretary, Mr. Benno Seidel.

The subscription was fixed at 2s. 6d. per annum.

The inaugural meeting was held at the residence of Mr. B. Seidel on 7th July. Mr. A. M. Makinson, Organising Inspector of the Agricultural Bureau, who was present, said the objects of the Bureau were to help the man on the land to make his occupation a more profitable one. Every farmer should help his neighbours by giving them the benefit of his experience. The Department of Agriculture was sending out experts to give lectures and demonstrations to members of branches whenever possible. The social side of the organisation should not be neglected, and at least one function of that kind should be held in each year. A good advertisement for the branch was also obtained by arranging an exhibit for the local show. A library should also be established in connection with the branch, and would be found very useful to members.

The Chairman agreed to read a paper on ensilage making at next meeting.

Coradgery.

The monthly meeting was held at the residence of Mr. H. N. Marriott, "Hubberstone," on 19th June. The meeting adjourned for five minutes, as a token of sympathy with Mr. G. C. Harris, a member of the branch who had received word of the death of his son at the Dardanelles.

The following motion, moved by Messrs. Clatworthy and Whitmill, was heartily endorsed by members:—"That members of the branch be invited to contribute from their next harvest at least one average acre of their wheat crop to war funds. The distribution of same to be left open at present, but at delivery contributors to choose their particular fund."

The Secretary is preparing a return of the area of land sown with wheat by members, and the acreage of the different varieties. From the particulars

already to hand it is thought there will be an increase over last year of nearly 40 per cent., and that Federation, as compared to all other varieties of wheat, will be as three to one.

Coraki.

A pruning demonstration and basket picnic was held recently under the auspices of this branch at the Chairman's (Mr. C. Patch) farm, Sandy Creek, when a very representative gathering of farmers and others interested put in an appearance, some journeying from great distances to witness it. Mr. Patch had made arrangements for the convenience of visitors, a large marquee having been erected, and seating accommodation provided.

Mr. H. W. Dowswell gave the demonstration, and took much trouble to show the various methods of pruning, showing both the right and the wrong way, and explaining the reasons why certain cuts were made, and others not. Amateurs subsequently took a hand, and proved that they had profited by the advice given.

Cundumbul and Eurimbla.

This branch had its monthly meeting in the Cundumbul School on 28th June. The chair was occupied by Mr. M. G. Hall, and sixteen members attended.

Samples of varieties of grain were received from the Department of Agriculture.

A clearing demonstration was conducted by Mr. C. W. Burrows, Assistant Inspector of Agriculture, on Mr. P. Arrow's farm on 6th July. There was a good attendance of members and others. Mr. Burrows at the outset explained that the reason gelignite was recommended for general use was that it had been proved to be safer and more adapted for the purpose than any other explosive. It had to be handled carefully, of course, but if proper care was taken it was perfectly safe. A large yellow box-tree was selected for the demonstration. Three holes were bored under the roots and two into the wood at the bottom of the tree, and in these holes twenty-five plugs of gelignite were inserted. The charges were connected by insulated wires to an electric battery, and discharged by means of it. The effect was to lift the large tree several feet in the air, the roots being entirely shifted out of position. The cost of the explosive was about 4s. 6d.

Mr. Burrows stated that for practical purposes only half the amount of gelignite need have been used, it being better to only shatter the tree and leave it for firing. He proceeded to show how this could be done. This time a dry gum stump was selected, a hole 2 feet deep was bored with an earth auger under the stump, and into it six plugs were placed. These were fired by fuse. The effect this time was not so impressive as formerly, but the roots were laid bare to a considerable depth, while the stump was split up the centre, and put in splendid order for burning.

Mr. and Mrs. Arrow supplied the gathering with afternoon tea, which was appreciated by all.

Hay.

The following paper on noxious weeds was read by Mr. M. T. Little at a recent meeting of this branch:-

SOME NOXIOUS WEEDS.

Bathurst Burr (*Xanthium spinosum*). This is by far the most objectionable of the noxious weeds growing in most localities, but it thrives best on alluvial flats, on black and grey soil plains, and in low-lying depressions, watercourses, and gullies, where water remains after rain. In the latter positions it survives the most severe drought. It is a prolific seeder, and owing to this fact, and to the peculiar hooked spines with which the seeds are covered, it is so troublesome, that when caught in the sheep's wool, the seeds remain there until removed during the process of manufacture. Apart from the injury done to wool it is a harmless and useless plant without fodder value. It seems impossible to entirely eradicate the plant, as the seeds, owing to their hard outer covering, remain dormant in the ground, retaining their vitality during the longest periods of drought, and germinating intermittently after summer rains Bathurst Burr is naturally most troublesome after a run of favourable seasons. During, and at the end of the seasons preceding the drought of 1902, it is said that many of the vacant lands and reserves near Hay were impassable for sheep owing to being covered with burr That this has not been the case since has been due to the unfavourable seasons and to the work of eradication by landowners. Any irrigated land is a nursery for this and other noxious weeds as there they resist the dry seasons.

Saffron Thistle (*Carthamus lanatus*).--In this district this has been proclaimed and is considered a noxious weed by many, but some believe that it is not harmful, but useful. Stock eat it when little else is available, and it is possible that it protects and shelters useful grasses during their early stages of growth. Saffron Thistle is a free seeder and is easily spread, the small seeds being carried by the wind and birds. It has remained isolated in a few localities where, in spite of a certain amount of destruction by landholders, it appears to be spreading. It is less harmful than Bathurst Burr, but more difficult to deal with, is checked by droughts and possibly, if a dry season is prolonged, as this has been, may be killed outright. Without any efforts being made to destroy the plant, it appears to disappear in certain areas, either as a result of disease or through being exhausted.

Star Thistle (*Centaurea calcitrapa*).—This, often confused with Saffron Thistle, is a totally different plant. The former has a number of very long sharp spikes, a short bushy habit of growth, and a purple flower, while the Saffron has a more upright stem, is less bushy, and has a bright yellow flower, and larger leaves. Star Thistle has never been plentiful in the district, the few plants seen having possibly been introduced in horse feed, as they are invariably found near roads and horse yards. In districts further east, however, it grows luxuriantly, and becomes a great pest.

Tobacco Plant (*Nicotiana glauca*).--This does not occur frequently in this district. It is generally found growing in river bends, where it grows quickly and is hard to eradicate. It is said to be poisonous to stock; fortunately, however, they seldom eat it. It resembles the Castor Oil plant.

Patterson's Curse (*Echium plantagineum*) is only found growing in a few localities, and always in sandy depressions, and on sandy soil that has been cultivated. There it grows very thickly, takes possession of the soil, and crowds out better plants. It causes most trouble when it takes hold in cultivation paddocks, where it decreases the yield, and grows nearly as fast as the crop. When the hay is cut, if grown with this plant, it will become mouldy in the stack, and its value when cut for chaff will be depreciated. In spite of the fact that in some districts it gives great trouble, and has been proclaimed a noxious weed, in this district it is considered by many to be a somewhat useful fodder plant It is readily eaten by sheep, especially if the land is heavily stocked. No doubt its growth will be checked by the drought. It does not appear to flourish on the black soil country, and has not yet made its appearance on the wheat lands in the north-eastern portion of the district.

Wild Melon or Paddy Melon (*Cucumis myriocarpus*).—This is common in the district, and most prevalent after summer rains. It is not considered a noxious weed here as sheep thrive on it. It occasionally causes deaths among horses, owing to the fibrous vine causing impaction and concretion in the intestines. Carriers' horses that have been

brought hungry in to the vine, are the principal victims. Horses running constantly on melon seldom suffer; when they do, it is generally the old animals, or animals with defective teeth. Melon-blindness is not very prevalent in the district.

Milk Weed (*Euphorbia drummondii*).—This is reputed to be poisonous to stock, but some consider it a useful fodder plant. That it occasionally causes the death of sheep is probably due to the condition of the animal at the time, and not to the plant itself, as numerous experiments have been made by feeding stock on this weed, but without proving conclusively that in all cases it causes death. It has a wide range of growth in the district, especially on the grey soil plains. It is sometimes called "caustic plant."

Mexican or Prickly Poppy (*Argemone mexicana*).—This is a poisonous plant, but stock seldom eat it. It is rare in the district, but several plants have been found near Hay, on the river frontage.

Cape Weed (*Cryptostemma calendulaceum*).—A small plant of low habit of growth, with large yellow flowers. In favourable seasons it grows abundantly on the Hay permanent common. It is said to give an offensive taste to milk and butter.

Nut Grass (*Cyperus rotundus*) is a native of Australia. It is very prevalent on the coastal rivers of New South Wales. It spreads quickly over cleared and cultivated land, and is one of the worst weeds that gardeners and orchardists have to contend with. If allowed to grow unchecked, it would take complete possession of a garden. Nut grass is prevalent in several gardens in the town of Hay. It has been found that the weed is frequently infested with a scale insect which destroys the roots of the plant. This insect is the subject of an article by Mr Froggatt, Government Entomologist, in the *Agricultural Gazette* of May, 1904.

Dock.—Where grasses are grown this weed must be considered a pest. It will outgrow most pastures if left unchecked. To eradicate dock is a difficult matter, owing to its prolific seeding habit, and when ploughed or hoed up not even a small piece of root must be left or it will grow. It is not very prevalent in this district, being mostly confined to river bends and irrigation holdings.

Dodder.—This must be considered a noxious pest owing to the amount of damage done by it. If left unchecked, it will kill a good stand of lucerne in a short time. Dodder can be exterminated by cutting, and leaving it where cut until dry, and then burning. It has been found that in most soils, unless dodder has a strong hold, that one burning off will completely kill it. It is mostly introduced by the seed being mixed with the lucerne seed, owing to their resemblance to one another.

A lecture on fruit-growing was delivered on 15th June by Mr. W. Le Gay Brereton, Orchardist of Glen Innes Experiment Farm, and he also gave a demonstration of winter pruning on the following day. Both were highly appreciated by those present.

Henty.

The ordinary meeting of this branch took place on Saturday afternoon, 10th July, Mr. R. O. Eulenstein, President, occupying the chair. The attendance was better than for some time past.

A notice of motion by Mr. R. O. Eulenstein to disband the branch in consequence of lack of interest, was dealt with. After animated discussion, during which it was made quite evident that members were strongly opposed to closing the branch, Mr. Eulenstein withdrew the motion. He expressed appreciation of the fact that the benefits of the Bureau were realised, and asked the members present to give all attention possible to the affairs of the branch, and to induce other farmers to join and attend the regular meetings.

A resolution was passed favouring the formation of branches of the Bureau at Pleasant Hills and Yerong Creek.

Inverell.

About thirty persons interested in fruit culture attended at Mr. W. Jack's orchard, "Fernmount," on 7th June, when a pruning demonstration was given by Mr. Le Gay Brereton, Orchardist of Glen Innes Experiment Farm.

Pruning, Budding, and Grafting.

The first tree selected by Mr. Brereton was a peach pruned by him on his visit last year. All the leaders on the tree were left last season and again this season, owing to the vigorous growth made. The demonstrator explained that the best method to adopt to check a strong-growing tree was to leave all leaders without pruning. This method also had the effect of causing lateral growth on the main limbs, which, in some cases, was much to be desired.

It was necessary to know whether the variety of tree being pruned was a heavy or a shy bearer. This was determined largely by locality. In Glen Innes, for instance, trees did not set their blooms nearly as well as in Inverell, and consequently the laterals should be left with more fruiting buds. In the case of a free bearer, the leaders could be shortened back and the laterals thinned in proportion.

Mr. Brereton then operated on a plum tree, on which last season's leaders had been left. The demonstrator explained that the plum bore fruit only on two-year-old wood and older, and that it was necessary only to remove laterals where they were too crowded. On this tree the leaders were again left their full length.

Mr. Ditzell, Chairman of the branch, thanked Mr. Brereton for his interesting demonstration and Mr. W. Jack for the use of his orchard.

The attendance at the lecture in the evening was limited by the threatening state of the weather. Mr. Brereton went into the various methods of grafting and budding, both for orchard and nursery work, in most cases giving practical demonstrations. For nursery work, where the stock was not too big, he advocated the tongue graft. Care had to be taken that the scion was not bigger than the stock, and that there was contact between the growing tissues on each. It did not matter if the scion were smaller than the stock, provided there was contact on one side. Care should be taken to wrap firmly, and for this purpose nothing was better than raffia. Apples should be worked a little higher above the ground than other fruits, so that when the tree was planted out into the orchard, the blight-proof stock would still be above the surface. For orchard grafting, either the crown graft or the strap graft was preferable to the old split or cleft graft. Both were worked in the bark, which was slit down from the sawn-off top for about an inch and a wedge-shaped scion inserted. In the case of the strap graft, a strip of bark from the scion was carried across the top of the cut and inserted in a slit on the opposite side of the limb. It was really an adaptation of the crown graft, and, while it took a longer time, in limbs of big diameter it produced a better result, as the sap was drawn from both sides of the limb and the cut soon healed over. The wrapping should be done carefully, binder-twine being very suitable. Grafting wax made of resin and raw linseed oil was also used. Since going to Glen Innes, however, he had abandoned wax altogether, as he found it scalded and sweated the grafts. A clay made from a mixture of cow-dung and clay and then wrapped with a strip of bagging, was much more satisfactory. In grafting vines the cleft graft was mostly used. The stocks were cut off level with the ground and a split was made in the centre, a wedge-shaped pointed scion—or two scions—being inserted, care being taken to see that the point of contact was adjusted. It was advisable that the wedge should not be trimmed down too fine.

In nursery work, the tongue-graft was used in obtaining blight-proof apple stocks—Northern Spy being chiefly used. A scion of that variety was grafted on to a root of the same sort, and the resultant tree was then used as a stock on which other varieties were worked. Grafting wood should be of the previous year's growth.

Budding was done with the new season's wood, though it was essential that the buds should be matured. It was also essential that the sap should be running in the stock to permit of the lifting of the bark for the insertion of the bud. It was not necessary to remove the wood from the bud as was once thought, as the little piece of wood tended to make the bud more rigid and facilitated handling. Budding was mostly used for stone fruits. In the orchard it could be used where grafts had failed. In some cases, old trees could be budded in the old bark, however thick. When that was done, dormant budding was resorted to—that is, the buds were not inserted until fairly late in the season. They would then "take" and remain dormant until the spring. As a general rule, dormant budding was preferable under any circumstances.

Katoomba.

A meeting of this branch was held on 5th July, when Mr. A. M. Makinson, Organising Inspector of the Agricultural Bureau, was present.

The election of office-bearers took place, resulting as follows: Chairman, Mr. H. Hicks; Vice-Chairman, Mr. C. Wooller; Treasurer, Mr. J. Knight; Hon. Secretary, Mr. W. E. Perry.

Kellyville.

This branch held its usual monthly meeting on 3rd July, when there was a good attendance of members. Mr. H. H. James (Chairman) presided.

Lankey's Creek (Jingellic).

There was a fair attendance of members at the meeting of this branch on 26th June, surrounding localities being well represented.

The principal feature of the evening's business was a discussion regarding local weeds and noxious plants. After a lengthy conversation, the meeting expressed the opinion that the following were the worst in the neighbourhood:—Sorrel, Dock, Fat Hen, Blackberry, Bathurst Burr, Sweet Briar, Saffron Thistle, Red Grass, Castor-oil Plant, Patterson's Curse, Paddy Melon, Stinkwort, Chamomile, and Black Oats.

Lower Portland.

The monthly meeting was held on 28th June. It was well attended and proved both interesting and instructive. A number of new members joined.

Mr. W. Booth read a paper, of which the following is a summary:

Suggestions to Farmers on Bookkeeping.

To every person taking on the business of farming, the first essential thought should be, "How shall I keep my accounts?" It is of paramount importance to know whether the business is a success or failure, and what portions are paying, and what are not yielding a fair return, and this can only be known by a system of bookkeeping. As the duties of the farmer are many and varied, and the hours generally long, the most simple methods consistent with accuracy will generally appeal to him. There are so many systems of book-keeping, that the selection of the one most suitable to the temperament of the person, and the conditions under which the farm is conducted, is in itself a difficulty; because after a hard day's work, not many farmers feel inclined to sit down and work out a set of books. It is first necessary to take an inventory. The necessary books are: a diary, ledger, and journal; the diary for entering anything that may occur during the day, the journal for entering the purchases and sales and any agreements that are made, and the ledger to "post up," or to act as an index for the journal, and to show the total amount of business done.

Mr. Booth explained many points of interest and importance, and suggested that the farm be subdivided into, say, five portions, viz., orchard, cultivation paddock, poultry runs, pig-runs, and horse and cow runs. These portions would necessarily be unequal in size and value, and so would have a proportionate rental value placed on them. The horse paddock could be credited with the value of work done by the horses, and same to be charged to the orchard, or cultivation paddock as the case might be. Then again, the approximate value of feed consumed by the horses should be credited to the paddock and charged against the horses. The cows should be credited with the value of milk received, and charged with value of feed consumed. Every portion of the whole farm could be treated in a similar manner. In this way the actual results of each department could be determined and any unprofitable branches turned down.

Many questions were asked and much discussion ensued, resulting in a very instructive meeting, at the conclusion of which a hearty vote of thanks was accorded Mr. Booth by acclamation.

The annual reunion was held on 9th July, and the function proved very successful. Representatives from the nearest kindred associations were present, and several new members were enrolled.

Martin's Creek.

A demonstration in the use of explosives for clearing, and of arsenic for killing green timber, was conducted by Mr. C. W. Burrows, Assistant Inspector of Agriculture, on 18th June.

A green grey ironbark stump, specially selected for the demonstration, proved, as anticipated, a tough problem. Three holes were bored in it, one being well into the tap root; six or seven plugs of gelignite were put into each hole, and the charges then connected and fired with a battery. Although the explosion failed to blow the stump out of the ground, it was shattered in such a manner that it was easily burned out three days later. While charging the holes Mr. Burrows fully explained every part of the proceeding, and gave a few warnings in regard to the handling of detonators, tamping, &c. Some other stumps were shattered for burning out, and the method of subsoiling fruit trees was also demonstrated.

The trees selected for the poisoning were White Mahogany, which is considered about the worst in the district to kill. Two trees were rung and one of these was poisoned. The leaves of the latter tree began to wither within four days. Whether it throws out suckers during the coming spring will be watched with interest, that being the main drawback in killing this species of timber.

A vote of thanks was accorded Mr. Burrows. The attendance was the largest that has been seen at anything of the kind in the district.

Miller's Forest.

The June meeting of the Miller's Forest branch was held on 15th June, the attendance being excellent.

The Secretary distributed seed of forty-eight different varieties of cereals received from the Department, and each member was requested to give a report when the crop had been harvested.

Discussion was then indulged in, relative to the twelve worst weeds in the district, and the following were given in order:—Star Grass, Bush Grass, Nut Grass, Garden Sorrel, Princess Feather, Blue Top Weed, Cat's Head, Paddy's Lucerne, Summer Grass, Paspalum, Noogoora Burr, and Cobbler's Peg.

Mr. J. McDonagh promised to read a paper on "Poultry Farming" at the next meeting.

The Secretary, Mr. A. J. O'Brien, then read a paper on the price per gallon that should be paid for dairy milk on the basis of that obtained for butter fat,

and for pigs and calves. Taking the operations of a dairy farm which supplied butter fat to a factory, he calculated whole milk to be worth 7¾d. per gallon over a period of twelve months.

Moruya.

There was a fair attendance at the monthly meeting of this branch on 25th June. A discussion took place on whether lucerne or red clover was the more profitable crop. Although in a few places excellent crops of lucerne are grown, the majority favoured the clover, as it would grow on almost any soil in the district. At first sowing, a hay crop of wheat or oats could be planted, while later good crops of clover hay could be cut, and the clover would stand any amount of feeding off. This is a great advantage over lucerne, particularly as there is generally a good growth of clover in early spring when green fodder is usually scarce.

Narrandera.

The June monthly meeting of the above was held at the Mechanics' Institute. Mr. Hopwood read a paper on the subject of "Fallowing," and the methods of improving the "Model Farm" were discussed by the members.

FALLOWING.

In preparing this paper it is not my intention to make an effort to describe the regular method of farming, as conditions vary according to the rainfall; as also does the class of land. In the first place, fallowing should be done as soon as possible after the previous seeding has been finished, it being understood that seeding is finished by 15th June. Should a farmer commence fallowing on 1st July, he will, under ordinary conditions, have a large portion of his land in a condition to receive the winter rain. He must bear in mind that if a wet winter is experienced (that is, sufficient to cover the ploughed ground at any time), and the ground is of a heavy nature, he will have to treat it later in the year, or very little benefit will be gained except that the land will be clean from weeds. Fallowed land with a hard surface does not hold extra moisture, even if the land remains idle; but if it is treated with a spring-tooth cultivator, and afterwards harrowed, or *vice versa*, as the condition of the soil may demand, it holds much more moisture. On this point it is impossible to work according to any set rule. It depends chiefly upon the condition of the land at ploughing. It may be too rough and require harrowing, perhaps twice, and then treating well with a disc cultivator. Again, if the land is ploughed mellow, it will probably be spoilt if followed by heavy rains. In any case if the texture is fine from continued working, and heavy rain falls in November, December, or January, the land will require to be worked with harrows or a spring-tooth cultivator after each fall, or the virtue of the fallow will be lost; and with a wind-swept surface, the land will be in a worse condition than land which had been only ploughed. The methods of working which I would advise are: For non-worked fallow, kill the weeds and leave the surface reasonably rough; and for well-treated fallow leave the surface fine, but loose. In the case of the well-fallowed land, one must be prepared to continue working, in some seasons, as many as ten times, a circumstance which makes the task no easier than it sounds.

DISCUSSION.—Mr. A. V. RUSSELL said he had reaped better yields off fallowed new land than he had done off stubble land, but not enough to justify him in going in for all fallowed land.

Mr. HOPWOOD said he thought if the stubble land was fallowed the yields would be larger. That had been his experience.

Mr. MINERS said Mr. W. Clark had a crop on a piece of well-fallowed land last year, and he was the only one about that end of the district who harvested any crop.

The consensus of opinion was that larger crops were harvested off fallowed land in ordinary seasons; and in time of drought the well-fallowed land was the only land which produced any crops at all.

Nimbin.

The usual meeting was held on 26th June.

Mr. Job Shipway introduced a discussion on potatoes, and submitted samples of about twelve kinds. The following is a *resumé* of the comments made on the different varieties:

Early Rose.—Likes rich loamy soil and warm situation.
Early Rose (Tasmanian).—Not as good as above; rather waxy.
Adirondack.—Good cropper on creek banks in the district.
Brownell's Beauty.—One of the best to grow.
Up-to-date.—Very good, but does not keep too well here.
Breese's Prolific.—One of the best for creek flats.
Burbank.—Quality good, but not a good cropper in the district.
Queen of the Valley.—Good quality potato, with good cropping and keeping qualities.
Satisfaction.—Good for winter crop.
Shipway's Early.—Good, but not a heavy cropper; quality good, flowery and dry. Mr. Shipway has grown two crops a year for twelve years. This is a variety introduced from America.

Mr. Shipway also showed a blue-skinned potato, the quality and production of which were good, but the tubers were small.

The various samples were examined with interest, and after discussion, a vote of thanks was passed to Mr. Shipway.

Parkesbourne.

A public demonstration of pruning was given by Mr. J. G. R. Bryant, Assistant Fruit Expert, at Mr. G. Brown's orchard, Parkesbourne, on 15th June. There was a good attendance of orchardists from the surrounding district, who watched Mr. Bryant's movements with keen interest, and all present gained much useful information on the most up-to-date and approved methods of pruning the various kinds of fruit trees grown in this district. The demonstration lasted over three hours, and was a great success in every respect.

The annual meeting of the branch was held in June, when all retiring office-bearers were re-elected for the ensuing year.

It was decided to hold the annual social in September next.

A paper from which the following paragraphs are taken, was contributed by Mr. J. H. Trevarthen at a meeting held on 23rd June:—

FRUIT CULTURE.

In fruit culture it is very essential before planting to ascertain the variety of fruit suitable to the soil and situation, for it often occurs that a mile or even less, makes all the difference in the vitality and productiveness of various kinds of fruit trees. Hence it is difficult to give correct information as to the best varieties in a given district. From my knowledge of the Goulburn district, and the class of fruit produced, I would recommend the following varieties to intending planters, both for commercial value and as average croppers.

Apples.—London Pippin (Five Crown), Jonathan, Granny Smith, Pomme de Neige (Snowy), Carpenter, Rymer, Buncombe, Northern Spy, and Delicious (a comparatively new apple). These all thrive well in cold climates. Dougherty also has given good results. Shepherd's Perfection is a regular and consistent cropper. Many other varieties are worth attention, viz., Beauty of Bath (early), Hoover (late), King David, McIntosh Red, Senator, Stayman's Winesap, Buncombe (Red Pearmain). Worcester Pippin as an early apple has given good results in Launceston. Black Ben Davis has not reached expectations,

either as to keeping quality or flavour. The Carrington variety although a heavy bearer does not give satisfaction in cold climates. Champion and Spitzenberg are well spoken of, and Cleopatra is a good apple under favourable conditions.

Pears.—Of all pears Williams or Bartlett appears to be best suited to the highland; then come Beurre Bosc, Beurre de Capiaumont, Packham's, Howell, Gansell's, Fertility, Red October, Marie Louise, Le Conte. Winter Nelis and Winter Cole only do well in certain spots. Idaho is a pear well spoken of as a heavy and regular cropper, but both shape and colour are somewhat against it becoming a favourite on the market. One might also mention Beurre d'Anjou, Late Duchess, and Fouqueray, but I think it is a mistake to plant too many varieties.

Peaches.—Where peaches can be grown, they are certainly one of the most profitable crops. The demand for canning fruit is ever on the increase, and growers would be well advised to pay more attention to varieties suitable for the purpose. Some of the best known sorts are Elberta, Gold Dust, Hawkesbury Champion, McDevitt's Cling, Pullar Cling, Shanghai Seedling, Yellow Italian, Maoriland.

Quinces.—For several years past there has been a scarcity of this fruit, and as the demand for jam purposes is largely on the increase, and the supply is not likely to equal the demand for at least a few years, I do not think one could do wrong by planting where conditions are favourable. Smyrna, Bourgeat, and Van Deman are considered the best of the newest varieties.

Plums.—Where conditions are suitable this is one of the most profitable fruits to grow. So far the Orange and Batlow districts have grown the best plums, but some very fine samples have also been grown round Goulburn. Some of the best-known sorts are President, Pond's Seedling, Grand Duke, Monarch, Giant Prune, and Angelina Burdett.

Gooseberries.—Owing to many Tasmanian growers digging out their plants a few years ago, this fruit has been in short supply and prices high. This shortage is likely to continue for some time, at least, so a small area under gooseberries should prove very profitable.

Cherries.—These are too well-known here to need much comment. Unfortunately, too much reliance cannot be placed on names, as frequently the same fruit is known under different names in various localities.

Having grown the fruit, the next step is to dispose of it to best advantage. In order to do this, it is necessary to have in each centre (as in Tasmania and parts of Victoria) a pulping and drying plant. This can only be done by combination, as no one produces sufficient inferior fruit to pay for running even a small up-to-date plant. Inferior fruit seldom pays to market, whilst it tends to depress the market for good fruit. By drying and pulping the market is relieved, and the grower gets at least sufficient to pay for his labour and trouble, and in all probability, a good margin of profit.

Cold storage is also necessary to successful fruit-growing, as it enables one to hold off a glutted market, and to take advantage of a rising one. Moreover, in the hot weather soft fruits will carry and keep much better if they have been placed in cold storage at a temperature of 35 to 40 degrees for twelve hours before being sent to market. I believe much of the loss experienced in connection with cold storage is caused by too low a temperature.

Much has been said and written against the present method of selling, but after an experience of methods in the other States, I have come to the conclusion that our system has advantages over the auction system, as the small trader can get his supply of assorted fruit to meet his requirements, without the time wasted waiting for the auction. Moreover, very often, auction sales tend to place the supply in the hands of a few large buyers, who afterwards supply the small dealer at a considerable advance.

Co-operative selling has been advocated and tried, but results have not proved any more satisfactory to the grower, and not until co-operative companies are in a position to establish jam and canning works can any advantage accrue to the grower over the present system of marketing.

Other subjects of interest to fruit-growers are spraying, cultivation, pruning, &c. But one of the most important factors in successful fruit-growing is grading and packing. The market value of much good fruit is not obtained owing to faulty packing and bad grading. Fruit should be packed sufficiently tight to prevent movement, yet not jammed in so as to bruise the skin. A little wood wool underneath and on top of the fruit prevents pressure as well as movement. Choice fruit will always repay the extra care and trouble. It is a good plan to wrap choice fruit such as apples and pears, especially if it is fairly ripe and the skin tender. In grading, many growers mark the size of the grade on the case, others state the number of pieces contained; the latter is considered best by buyers for the retail trade.

Sackville.

A paper on tomato culture was contributed by Mr. C. Aspery at the monthly meeting of this branch on 24th June, and was the subject for discussion by members.

Tomato Culture.

The cultivation of the tomato has greatly extended of late. A few years back this fruit was not grown for market to such an extent as it is at the present time. In most places it was only grown for private use; but at the present time there are thousands of cases sent to Sydney yearly, and at times there is a glut, the supply becoming too heavy for the demand and prices becoming very low. This fruit is now largely sought after by the jam, sauce, and pickle factories. If these factories continue to use this fruit in large quantities every year, and the population of the State increases, there will be a greater demand, and, I think, better prices will be realised for the fruit.

The first point that the grower has to think about is the raising of the plants. The seed bed should be prepared in a warm locality. The bed should be deeply dug up, and if the ground is not moist enough for the seeds to germinate, it should be watered, but not made too wet. I do not think that the seed bed requires manuring too heavily as the young plants will grow too tender and weak, and will not stand transplanting so well as plants that have been grown under harder conditions.

The best way is to scatter a handful or two of fertiliser over the ground before sowing the seed. I prefer blood and bone. When the seed is sown, cover lightly with moist soil, and put on a thin layer of stable manure. When this manure is moistened it will help the soil to retain the moisture underneath, and it also keeps the soil from going hard and crusting. A good plan is to water the seed bed occasionally with warm water; this creates warmth and helps the seed to germinate more quickly than if watered with cold water. It is a bad practice to sow the seed too thickly, as there is a tendency for the plants to grow too weak and slender. The stronger the plant the better the result when transplanting.

Then again, if the plants require to be forced quickly in their growth, a good plan is to excavate the ground to a depth of 6 inches or so where it is intended to sow the seed, and put in a layer of old straw and stable manure to a depth of about 4 inches, about three or four weeks before it is intended to sow the seed, and keep this well watered with hot water. This will cause the straw and manure to heat and decompose quickly, and at the same time make an excellent hot-bed. The seed when planted in this bed will germinate quickly, and the young plants will grow rapidly, but they will be very tender and will not stand handling so well as if grown by the slower method.

Having the plants nearly ready for transplanting, the next consideration is to get ready the ground where it is intended to transplant them to. Tomatoes do extremely well on good loamy soil, but the soil does not require to be too rich, as the plants will make too much vine and the production of fruit will be small. A plant that makes a rank growth rarely bears much fruit. Tomatoes should not be planted less than 4 feet apart. It is not advisable to plant out too early, as there is a danger of them being destroyed by frost. In the early spring it pays the grower to only plant a few each day, so that they can be covered with small bushes and be protected from the frost, whereas if a large number are put out in one day, the possibilities are that they cannot all be covered at night, and a frost may cause serious loss. The majority of growers prepare for planting by drawing in to the furrow, at desirable distances, a portion of the earth thrown out when making the drill. This is accomplished by means of a hoe. If the plants are large this method makes it more difficult to protect them from the frosts. A very good method is to set the plants at the bottom of the drill, which is done by just pulling a handful of soil in when planting. No manure is then used at the time of planting. The plants will not be on solid soil if the ground has been ploughed deeply beforehand, and drilled say 5 or 6 inches, and the roots will have plenty of loose soil to feed in. This method saves time in making holes with the hoe or fork, and the plants are more easily protected from frost, and I think they grow equally as well as if planted by the former method. Those planted in the way suggested should be manured before the soil is worked, by sprinkling about a dessertspoon to a tablespoonful of fertiliser around each plant. In the other case the ground is manured before planting. It is a bad practice to use too much manure, as there is a great tendency for the plants to make too much growth and to bear very little fruit. Like every other crop, tomatoes will not produce a good return if cultivation is neglected. It pays to cultivate while there is room to get the horse and cultivator between the rows of plants without damaging them, as it keeps the soil from going hard, and helps it to retain moisture.

The principal varieties grown in this locality are Burwood Prize, Red Stem, Earliana, and a variety locally known as the King tomato, which is a very good cropper. Burwood Prize is, I think, the best all round tomato to grow, as it yields large crops and is a good drought resister, and the fruit is not so liable to be burnt by the sun, being sheltered by its heavier foliage. It is a bad practice to let too many of the fruit get ripe on the vine, as there is always a large percentage of waste, and it also does harm to the vine. The fruit should generally be marketed on the green side but on the other hand, if there is a demand for ripe fruit, a good plan is to pull the fruit when green, place it in a shed on a bed of straw and cover it with a heavy layer of corn-sacks; this will cause the fruit to heat and they will ripen very quickly. The diseases that tomatoes are most subject to are "Cauliflower disease" or "Rosette," and "Black Spot." Both are very destructive at certain times of the year. The only cure for the former disease is to pull up and destroy the plant, as soon as it makes its appearance, as it soon spreads through the bed, and once it gets a hold, the plants will bear no more fruit, and what fruit is on the vine goes hard and becomes of no value.

"Black Spot" causes far more loss to the grower and spreads more rapidly through the bed. There are several things that may influence the occurrence of this disease, such as seed being saved from infected beds, too much manure being used (this, I believe, is the most common cause), and probably the season. The cutworm is also a great enemy of the tomato-grower. In some seasons it is very destructive, but most so in dry seasons. One method of destroying it is to lay baits, made of pollard and Paris green, around the plants. Another good way is to go through the bed, move the soil away from around each plant, and pour in about a quart of water. When the water settles into the soil, the soil can be replaced. This will help to keep the cutworms away, as they do not work through moist soil so readily as through dry.

A pest that is very destructive to tomato bloom, especially in the early beds, is the thrips. This little insect hides itself inside the bloom where the fruit develop, but before the fruit has time to form it sucks all the substance out of the bloom and causes it to drop off.

Stockinbingal.

The monthly meeting of this branch was held on 19th June, when the subjects for discussion were lamb marking, and tillage of the soil after sowing the crop.

Mr. A. Gilmour opened the discussion on lamb marking, saying that he was in favour of yarding the sheep early in the morning as quietly as possible, and marking in the usual way, using a 5 per cent. solution of sheep dip as a dressing, and turning the lambs out into a clean paddock. A dusty paddock would be likely to cause blood poisoning.

The question was raised whether it is necessary to mark in fresh yards every year. Some members were of opinion that it was not advisable to use the same yards for marking year after year, while others were of opinion that they could be used for years without danger, provided all offal was destroyed after each marking. This appeared to be the general opinion of the members.

The subject of working land after sowing was very fully discussed, and members were unanimously in favour of it when the plant had started to stool well, or when it appeared over the ground. If there was just sufficient moisture to shoot the grain, and the ground was crusted on top, with only some of the plants coming through, to harrow the ground would assist the plants through the surface. It would also conserve the moisture. An oval tined or sharp-toothed harrow should be used for the purpose, as a thick tined harrow would most likely pull up a greater number of plants.

Tallawang.

The regular monthly meeting of the above branch was held on 26th June, the subjects under review being: (1) Which is the best general-purpose plough for this district, the mould-board or the disc; and (2) which is the more advantageous for this district, mixed farming or agriculture only.

For the next meeting it is proposed to discuss methods of eradicating rabbits, and also co-operation among farmers

Temora.

A meeting of the Temora branch was held on the 6th June.

Mr. de Little promised to read a paper at next meeting of the branch on sowing or drilling of wheat.

United Peel River, Woolomin.

The annual meeting of this branch was held on 5th June, when the report and balance-sheet were presented, showing that during the last half of the year five meetings had been held, and one demonstration in the use of explosives had been given by an officer of the Department of Agriculture. The year had closed with forty-six financial members.

The election of officers resulted as follows:—Chairman, Mr. J. W. Newman; Vice-Chairmen, Messrs. J. Starr, N. Foster, G. Mathews, and H. Hannaford; Treasurer, Mr. N. Foster; Hon. Secretary, Mr. C. J. MacRae.

The membership fee was again fixed at 2s. 6d.

A demonstration of winter pruning was given at Woolomin on 12th June, in Mr. J. W. Newman's orchard, by Mr. W. Le Gay Brereton, Orchardist of the Glen Innes Experiment Farm. There were about thirty present, and great interest was taken in the proceedings.

Mr. Brereton gave a practical demonstration of the pruning required by different varieties of trees, at the same time explaining their different habits. He advised growers to start pruning in the very early stages of the tree, and favoured a low head from 12 to 18 inches high, starting with two or three limbs well balanced round the tree. If the growth was not even, it could be regulated by pinching the strongest growth back in the summer time, the object for the first three or four years being to shape the tree. Where a tree made a very strong growth, he advised leaving the leaders untopped; this would tend to check the growth. The object of pruning was to have every part of the tree accessible, and to encourage the laterals to throw out fruit spurs. The different methods of grafting and budding were also explained.

The usual monthly meeting was held on 7th July. It was decided to hold a sports gathering on 14th August, the proceeds to be devoted to the Australia Day Fund.

A committee of six members was appointed to arrange for papers to be read at monthly meetings, and to prepare a list showing the departmental experts whom the branch would like to visit the district during the year.

Orchard Notes.

W. J. ALLEN.

August.

Spraying.

The winter spraying of deciduous trees should be commenced with the lime sulphur solution, which is both an insecticide and a fungicide. A sharp look-out should be kept for aphis on peach trees. Resin and washing-soda, tobacco-wash, or red-oil emulsion will be found useful in keeping this pest in check. A careful watch should also be kept for woolly aphis and mussel scale, and should any trees be found affected they should be carefully pruned, removing and burning as many of the infested twigs as possible. Spray thoroughly with red-oil emulsion.

All fruit-houses should be kept as clean as possible, as there is no doubt they are responsible for harbouring a great many codlin moths every year.

Last fruit season coastal and tableland orchards suffered considerably from the effects of Brown Fruit Rot and Black Spot. In cases where these diseases were present, a thorough spraying should be given the trees with either Bordeaux or lime-sulphur, winter strength, before the buds burst.

Care should be taken to see that the spray outfit is kept in good working order, especially the valves and nozzles, which should be constantly cleaned. Spraying material should be ordered well ahead, as there appears a possibility of a shortage of supplies.

Swabbing Vines.

Vines should be dressed with either a sulphate of iron solution and sulphuric acid, or the latter alone, for the control of anthracnose (Black Spot). This is particularly necessary in the coastal vineyards. The dressing is applied to the new spurs or canes by a brush or swab. It must be followed by summer spraying with Bordeaux mixture in the event of a rainy or foggy season, to secure the best results.

Ploughing.

This work should be completed as early as possible so as to conserve soil moisture. Land amongst such trees as cherries, apricots, and early peaches must be worked up early now so as to get size into the fruit. In the coastal orchards ploughing should be completed as early as possible, and followed by the regular use of the cultivator. Each spring many growers get behind with ploughing, and the orchards suffer considerably. Ploughing and cultivation are most important operations once the springtime begins.

Cover Crops.

Green manures should be ploughed under, so that the plant-food locked up in them may be made available when the tree requires it to mature its fruit. If the crops are allowed to remain until the land becomes dry, it will be found almost impossible to plough it, to say nothing of turning the crop under; and the chances are that, instead of doing good, the opposite effect will result. The moisture, in place of being conserved, will have been taken up by the crop, in consequence of which the soil will have become hardened. When ploughing is attempted, the ground will break apart in lumps, and it will be found impossible to turn the crop under successfully, which will thus dry up instead of rotting as it should.

In hot dry districts the crop may not be fit to plough in until the end of the month, but no time should be lost now in turning it under.

Planting.

The planting of deciduous trees should be completed as early as possible this month. The earlier a tree is planted in the winter the better it usually does, particularly if the spring should prove a dry one. The later planted trees will in all probability make a much weaker start than those planted earlier in the winter.

When planting, the greatest care should be taken to spread out the roots. Any damaged ones should be removed, as they tend to encourage white ants to destroy young trees, and also allow of fungus injury.

Citrus trees of all kinds can be planted out in the last week of this month. In frosty situations the planting should be left until all danger of late frosts is over. Be careful that the roots are not exposed to either wind or rain during the operation of planting, nor should they be allowed to suffer subsequently from any lack of moisture. Cut the trees well back when planted, and mulch the surface with well-rotted straw or stable manure.

Manuring.

Growers who intend using quick-acting fertilisers should make the first application this month. It is better not to apply too much at one time, but rather make two applications—one now, and one after the fruit has set. Spread the fertiliser well through the rows, taking the outer fringe of foliage as usually a good guide as to where to commence sowing the manure. In the drier districts, where late rains are uncertain, it is better to make the application early than late, as it is well known that they do not give the same results if applied when the soil is at all dry. Regular light annual dressings of from 3 to 5 cwt. per acre should be the rule of the orchardist. In light poor soils, where trees are in full bearing, at least 10 cwt. per acre should be applied.

Pruning.

This work should be completed this month, care being taken in the performance of the work to see that the limbs are evenly spaced, and due regard should be given each variety in order that they may be pruned in

such a manner as will ensure them giving the best results. Citrus trees should be pruned this month if possible, but require only a light thinning out of surplus shoots throughout the centre to allow of the admission of a fair amount of sunlight. All dead wood should be removed.

Grafting.

The latter part of this month is a good time to start the grafting of deciduous nursery stock, and should there be any unprofitable apple, pear, or other trees standing in the orchard, these also may be grafted to good varieties.

Repairs.

Preparation should be made for the forthcoming spring and summer work. Implements should be repaired, painted, and readjusted. Fences should be repaired, especially the wire netting, as rabbits and hares are usually prevalent at this season.

Harvesting.

The marketing of citrus fruit will continue. Mandarins should not be left too long on the trees, as in many places they become puffy, and consequently are not so valuable.

Varieties of Fruits recommended for planting in the Eastern and Southern Suburbs of Sydney.

The following are recommended as suitable for planting in the suburbs mentioned :

Apples. Allsop's Early, Carrington Red, Granny Smith
Apricots. Newcastle, Camden Superb.
Citrons. Lemon shaped.
Figs. Blue Provence, Brown Turkey.
Grapes.- Black Hamburg, Black Muscat, Gordo Blanco, Doradillo.
Guavas. Strawberry.
Lemons. Lisbon, Eureka.
Loquats Herd's Mammoth.
Mandarins. Emperor.
Nectarines.—New Boy, Goldmine, Albert Victor, Meek's Scarlet.
Oranges. White Siletta, Washington Navel, Valencia Late.
Passion Fruit. Common.
Peaches.- Edward VII, Triumph, Wiggins, Elberta, Red Italian.
Pears.--Williams, Kieffer.
Persimmons.—Tanenashi, Dai Dai Maru.
Plums.—Evans' Early, Angelina Burdett, Diamond.
Plums (Japanese). Wright's Early, Burbank, Wickson.
Pomelo (Grape Fruit).—Triumph.
Quinces.—Portugal, Missouri Mammoth. .
Strawberries.—Aurie, Cresswell.

Government Stud Bulls available for service at State Farms, or for lease.

Breed.	Name of Bull.	Sire.	Dam.	Stationed at—	Engaged up till—
Shorthorn ...	Melba's Emblem (Vol. IV, M.S.H.B.)	Emblem of Darbalara (100 M.S.H.B.)	Melba 3rd of Darbalara (1058 M.S.H.B.)	Berry Farm ...	‖
" ...	Imperialist ... (183 M.S.H.B.)	Florio	Lady Nancy of Minembah.	Berry Farm ...	*
Jersey ...	Grenadin (imp.)	Attorney (9477)	Cyril's Carnation (imp.).	Yanco Farm ...	*
" ...	Trafalgar ...	Best Man ...	Rum Omelette	Cowra Farm ...	*
" ...	Kaid of Khartoum	Sir Jack ...	Egyptian Belle	H. A. College ...	*
" ...	Leda's Rotford Pride.	Dinah's Lad ...	Leda's Angel..	Wagga Farm ...	‖
" ...	Goddington Noble XV (imp.)	Goddington Noble	La Franchise 3rd.	" ...	*
Guernsey ...	The King's Mirror	Calm Prince ...	Vivid (imp.)...	Woodburn ...	19 Oct., '15.
" ...	Godolphin Moses (imp.)	Golden Hero of the Vauxbelets (1929)	Rosetta (6509)	Wollongbar Farm	*
" ...	Hayes' Fido (imp.).	Hayes' Coronation 3rd.	Hayes' Fi-Fi 2nd.	Wollongbar ...	30 Nov., '15
" ...	Claudius (imp.)	Golden Star II..	Claudia's Pride (imp.).	Murwillumbah ...	30 Dec., '15.
" ...	George III ...	King of the Roses	Calm 2nd ...	Wollongbar Farm	‖
" ...	The Peacemaker	Calm Prince ...	Rose Petersen	Wollongbar Farm	‖
" ...	King of the Roses	Hayes' King ...	Rosey 8th (imp.).	South Kyogle ...	30 Jan., '16.
" ...	Lauderlad ...	Laura's Boy ...	Souvenir of Wollongbar	Mullumbimby ...	6 Oct., '15.
" ...	Belfast	King of the Roses	Flaxy 2nd ...	Tyalgum	29 Nov., '15.
" ...	Royal Preel ...	Itchen Royal ...	Hayes' Lily du Preel (imp.).	Murwillumbah ...	30 Aug., '15.
" ...	Alexander the Great.	Claudius (imp.)	Alexandrina of Richmond.	Warneton ...	27 Sept., '15.
Ayrshire ...	Wyllieland Bright Lad (imp.)	Wyllieland Gleniffer (7229)	Wyllieland Sangie	Glen Innes Farm..	*
" ...	Isabel's Majestic	Majestic of Oakbank.	Isabel of Glen-eira.	Grafton Farm ...	‖
" ..	Lessnessnock (imp.) (500 A.H.B. of A.)	Marshal Oyama (5841 A.H.B. of S.)	Bloomer B. of Lessnessnock.	" ...	‖
Holstein ...	Sultan La Polka (imp. N.Z.)	King of Dominos (297 N.Z.H. & F.H.B.)	Princess La Polka (292 N.Z.H. and F.H.B.)	Berry Farm ...	*
Kerry... ...	Castle Lough Ranger (imp.)	Waterville Rover	Castle Lough Lizzie.	Bathurst Farm ...	*

*Available for service only at the Farm where stationed. † Available for lease or for service at the Farm where stationed.
‖ Available for special service where stationed upon application to the Under Secretary.

E

BULLS FOR SALE

AT HAWKESBURY AGRICULTURAL COLLEGE.

RED POLL.—Belmont Ajax (No. 1/2): calved 7th January, 1912; colour, red; sire, Acton Ajax (imp.) (9,655); dam, Shamrock, by Magician, (imp.) (5,021): from Spinster, by Laureate (imp.) (1,563) from Spot (imp.) (5,136 R.P.H.B.). Price, **30 guineas.**

AT BERRY EXPERIMENT FARM.

MILKING SHORTHORN.—Prince of Temora: date of birth, 1st March, 1914; colour, roan; sire, Cameo of Darbalara, (154 vol. iii, M.S.H.B.); dam, Primrose VIII of Darbalara (passed vol. iv., M.S.H.B.), by Emblem of Darbalara (100 M.S.H.B.) from Primrose of Bolaro (568 vol. i, M.S.H.B.). Price, **15 guineas.**

No record of dam. Calf allowed to suckle.

JERSEYS.—Wagga Aeronaut (315): calved 20th March, 1914; colour, whole fawn; sire, Grenadier (imp.); dam, Wagga Aitua (787 A.J.H.B.). Price, **12 guineas.**

Wagga Commander (319): calved 10th June, 1914; colour, whole fawn; sire, Aitua's Lad; dam, Wagga Clover (781 A.J.H.B.); Aitua's Lad, by Kaid of Khartoum, from Wagga Aitua (787); Kaid of Khartoum, by Sir Jack from Egyptian Belle (382); by Tidy Punch from Egyptian Princess (imp.) (65 A.J.H.B.). Price, **12 guineas.**

GUERNSEY BULL.—Desmond II: born October, 1913; colour, orange fawn; sire, Desmond, by Trequenor Mike (imp.) from Desdemona 8th (imp.); dam, Gertrude (62 A.G.H.B.), by Calm Prince (2 A.G.H.B.) from Beatrix XIV (imp.) (10 A.G.H.B). Price, **30 guineas.**

Milk yield :—	Milk lb.	Fat per cent.	Butter lb.
Gertrude (3 months)	1,780	4·8	95·07
Beatrix XIV	6,791	5·0	400
Desdemona VIII	6,721	4·3	340

AT BATHURST EXPERIMENT FARM.

KERRY BULL.—Aicme Sun: born 21st October, 1914; colour, black; sire, Kildare II, by Kildare (imp.) from Belvedere Bratha 3rd (imp.); dam, Aicme Venus II, by Aicme Chin (imp.) from Belvedere Bratha 3rd (imp.), by Belvedere Black Prince from Bratha II, by Garrague, from Bratha. Price, **8 guineas,** f.o.r.

	Milk lb.	Fat per cent.	Butter lb.
Milk yield of dam (7 months. Still milking) ..	4,362	4·63	234·06
Milk yield of Belvedere Bratha III	8,310	4·51	442

D.S.O.: born 15th November, 1914; colour, black; sire, Rising Sun, by Bratha's Boy from Dawn; dam, Bathurst Beauty, by Kildare II from Lady Critic, by Belvedere Gay (Gay Knight (imp.) from Aicme Clipper. Price, **7 guineas,** f.o.r.

	Milk lb.	Fat per cent.	Butter lb.
Milk yield of dam (6 months. Still milking) ...	3,286	4·67	172

Both are well grown, typical young bulls.

BULLS FOR SALE—*continued.*

AT GRAFTON EXPERIMENT FARM.

AYRSHIRE. No. 45: born 27th March, 1914; colour, brown and white; sire, Defiance of Camden (863 A.A.H.B.), by Fairfield Maine's Darkie (imp.); dam, Betty II of Numba, by Jamie of Numba (951 A.A.H.B.) from Betty of Culcraigie (imp.) (13644 A.A.H.B.); Jamie of Numba is by Jamie of Oakbank from Rapture of Oakbank. Price, **12 guineas.**

No. 42: born 27th March, 1914; colour, white and brown; sire, Jamie's Heir, by Jamie of Oakbank; dam, Belladonna of Russley, by Duke King of Ardgowan (imp.) from Belides; by Victor of Munnoch (imp.) from Bella (64 A.A.H.B.), by Gladstone from Beauty IV, by Cicero from Beauty III, by Nimrod from Beauty II, by Dunlop from Beauty (imp). Price, **12 guineas.**

No. 32: born 15th December, 1913; colour, brown and white; sire, Jamie's Heir, by Jamie of Oakbank; dam, Countess of Wollongbar, by Craigielea (542 A.A.H.B.) from Countess II of Gleneira, by Lad O'Kyle (imp.) from Countess of Gleneira (938 A.A.H.B.), by Edgar (177 A.A.H.B.) from Gaiety (1006 A.A.H.B.), by Dainty Davey from Princess, by Prince from Pet, by Fred from Scottie, by Ayrshire Lad. Price, **15 guineas.**

GEORGE VALDER,

Under Secretary and Director of Agriculture

AGRICULTURAL SOCIETIES' SHOWS.

Secretaries are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 21st of the month previous to issue. Alteration of dates should be notified at once.

1915.

Society.	Secretary.	Date.
National A. and I. Assn. of Queensland (Brisbane)...	J. Bain ...	... Aug. 9–14
Narandera P. and A. Association	H. S. Robinson ...	,, 10, 11
Trundle P. and A. Association	W. E. Herborn ...	,, 10, 11
Corowa P., A., and H. Society...	J. D. Fraser ...	,, 16, 18
Murrumbidgee P. and A. Association (Wagga) ..	A. F. D. White ...	,, 24, 25, 26
Parkes P., A., and H. Association	G. W. Seaborn ...	,, 25, 26
Ariah Park P., A., H., and I. Association	J. E. Rowston ...	,, 31, Sept. 1
Germanton P., A., and H. Society	J. S. Stewart ...	,, 31, ,, 1
Grenfell P., A., and H. Association	G. Cousins ...	,, 31, ,, 1
Albury and Border P., A., and H. Society	W. I. Johnson	... Sept. 7, 8, 9
Young P. and A. Association	T. A. Tester ..	,, 7, 8, 9

AGRICULTURAL SOCIETIES' SHOWS *continued.*

1915.

Society.	Secretary.	Date.
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Cootamundra A., P., H., and I. Association	T. Williams ...	,, 14, 15
Canowindra P., A., and H. Association	G. Newman ...	,, 21, 22
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1916.

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Kiama Agricultural Society	G. A. Somerville...	,, 26, 27
Inverell P. and A. Association	J. McIlveen ...	Feb. 22, 23, 24
Newcastle A., H., and I. Association	E. J. Dann ...	,, 23, 24, 25, 26
Southern New England P. and A. Association (Uralla)	H. W. Vincent ...	,, 29, Mar. 1
Berrima District A., H., and I. Society	C. E. Wynne ..	Mar. 2, 3, 4
Tenterfield P., A., and M. Society	F. W. Hoskin ...	,, 7, 8, 9
Crookwell A., P., and H. Society	M. P. Levy ...	,, 9, 10
Nepean District A., H., and I. Society	P. J. Smith ...	,, 10, 11
Central New England P. & A. Association (Glen Innes)	G. A. Priest ...	,, 14, 15, 16
Coramba District P., A., and H. Association ...	H. E. Hindmarsh	,, 15, 16
Manning River A. and H. Association	L. Plummer ...	,, 15, 16
Gundagai P. and A. Society	A. Elworthy ...	,, 15, 16
Walcha P. and A. Association	J. N. Campbell ..	,, 15, 16
Camden A., H., and I. Society	A. E. Baldock ...	,, 15, 16, 17
Armidale and New England P., A., and H. Assoc'n.	A. McArthur ...	,, 21, 22, 23, 24
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Quirindi District P., A., and H. Association... ...	C. G. Brandis ...	April 4, 5, 6
Cooma P. and A. Association	C. J. Walmsley ...	,, 12, 13
Bathurst A., H., and P. Association	S. V. Turrell ...	,, 12, 13, 14
Upper Hunter P. and A. Association (Muswellbrook)	R. C. Sawkins ...	,, 12, 13, 14

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Agricultural Gazette of New South Wales.

Wheat-breeding in New South Wales.

[Continued from page 650.]

J. T. PRIDHAM, Plant Breeder.

Crossing.

THIS is looked upon by many as a mysterious performance, requiring considerable skill and experience. As a matter of fact, the operation of crossing is simple, merely demanding patience and care; it is the disposal of the progeny of a cross which calls forth the judgment and perseverance of the plant-breeder.

Crossing is employed in order to induce variation in the plant, and since the discovery of Mendel's principles of inheritance, it is no longer looked upon as a game of chance. Luther Burbank's "Creations," so called, exhibit characters detected to a slight degree in plants and augmented by crossing and selection. The addition of other characters by means of crossing so changes the appearance of the progeny that one would imagine something entirely new to have been discovered. However, we may expect to find no character in the offspring that did not exist in either a visible or a latent condition in one of the parents.

Crossing should be undertaken with the object of improving a variety in some direction. All varieties have some defect which is more or less apparent, and this can be corrected by crossing with a variety which is superior in that respect.

We may here describe the operation of artificial crossing:—The wheat head is provided with a row of spikelets on each side of its central axis. Each spikelet bears two or more flowers enclosed in the glumes or chaff. Soon after the heads have appeared the crop begins to flower; at this stage tiny pollen bags or anthers show themselves between the glumes, and at the foot of the plant lies a yellowish powder which is the ripe pollen, or what remains of it after the bags have burst. On opening the chaff a tiny white feathery object may be seen at the bottom of the flower, called the stigma or female organ. Each flower contains three anthers, which usually burst before, or at the time of, emerging from the chaff, scattering pollen grains upon the stigma. This is the act of fertilisation, and day by day the embryo increases from the size of a pin's head till it becomes the full-sized grain. In crossing, the breeder extracts the three anthers with a fine-pointed pair of forceps before they swell and turn yellow, leaving the stigma untouched. It is convenient to emasculate only the large lower flower on each spikelet, which blossoms before the smaller ones. Twelve flowers will generally be sufficient to operate upon, and the chaff may be clipped short with a pair of scissors above and below the flowers worked upon to show the position of the grains to be produced by crossing. A coloured rag-tie is put just below this head of the mother plant. Next, visiting the plot occupied by the variety chosen to be

the male parent, the breeder selects a productive early heading plant and cuts off an ear which has just begun to flower. Holding it lightly in the hand, he returns to the mother plant. By the time he is ready to effect the cross the warmth of the hand will have ripened the pollen in one or two flowers, and an anther should be introduced with the forceps and gently pressed against the chaff to release the pollen grains, which fall upon the stigma. With a little practice the chaff of the flower may be held open by the thumb-nail of the left hand while the pollen is introduced. The work must be fairly quickly done, or undue handling will dry up the tender parts of the flower. One anther will often fertilise two or three flowers, but in windy weather the pollen may have to be expended on one. After cross pollination, a convenient method of closing the head is to use a scrap of mosquito-netting or muslin, wound round with fine thread to keep the chaff closed and to exclude foreign pollen. It is advisable that the mother head shall have started to flower, though we have been successful in crossing before this stage. It is necessary to keep the forceps clean and to remove from the mother head any flowers where anthers have burst. There is no need to cut away from the head all the flowers not operated upon; their pollen will ripen after the head has been tied up in muslin; but if securely enclosed the anthers will not protrude, and there will be no danger of their affecting the fertilisation of the crossed flowers.

The wrapping may be left on the head until harvested. Crossing can be done most rapidly in warm weather, and the early morning is the best time; in the afternoon fresh pollen is hard to secure. With regard to the quantity of pollen to use there is no danger of giving too much in nature an abundance is provided for each flower. All the emasculated flowers should receive pollen when making a cross, even if the stigma does not seem to be ripe enough; the pollen has good keeping qualities, and will fertilise the ovule when it is receptive. The date, name of male and female parents, and the descriptive tie used is then entered in the field note-book.

We have not found any essential difference in the behaviour of reciprocal crosses; whether a variety is used as the male or the female parent in a cross does not seem to affect the progeny. The effect of crossing is usually to induce exceptional vigour, seen in greater height and productiveness in the next generation after the cross. This vigour gradually diminishes, and by the time the crossbred is fixed--four to seven seasons usually—it has settled down to the normal vitality of its existence.

Natural Crossing.

Darwin says: "The flowering structures of all plants are so arranged that we may conclude that . . . the capacity of occasionally intercrossing is present or has been formerly present with all plants."* Aaronsohn's wild wheat intercrosses regularly by means of the peculiar mechanism of the flower, which opens for a time early in the morning, allowing foreign pollen to enter; and the fact that the stigma is receptive before the anthers are ripe in some flowers makes cross-fertilisation common with this species.

* Variation of Animals and Plants, p. 85.

Messrs. Garton Brothers state that natural crossing "does not exist" with wheat in England. Professor Biffen, of Cambridge, says: "I have never met with a case." Blount, of America, said he had never known of a cross taking place naturally. Perkins, of South Australia, has not been convinced of its occurrence. Koernicke, at Popplesdorf, however, records several cases, and says that the club or square-head type is most disposed to it. Nilsson, of Svalöf, reports instances of it in warm weather. In India it has been found by Howard to occur very commonly in the Punjab, where the air is very dry and warm at flowering time. Pye, of Victoria, has discovered a number of cases in his breeding plots. Mr. Inspector Birks reports that Mr. Roach, of Gilgandra, has been selecting types of wheat from field crops, and is "convinced that some must be natural crosses from their tendency to sport."

In 1908 an instance was noticed by the writer at Longerenong, in Victoria, and five cases in the following year. We have come across several since, in Indian varieties particularly. In 1911, a plant, in a plot of Huguenot, 12 inches higher than the rest was found by Mr. Hurst at the Wagga Experiment Farm, and its seed planted next year yielded progeny very diverse in type.

Mr. Farrell, of Walmer, Parkes, has been experimenting with wheat, and has produced what are undoubtedly natural crossbreds. He mixes together the seed of two varieties before planting, and each year searches the crop for variations. Several sorts have been grown in our test plots, and have shown the characteristics of their parents in a greater or less degree. One named "Walmer" seems a promising variety, with the foliage and height of Steinwedel and a head of the Federation type, these two wheats being its alleged parents. A width of 16 inches between the breeding rows seems to be enough, as a general rule, to prevent artificial crossing.

Mr. Farrell's experiments throw a fresh light on the sowing of impure seed. Mixed seed must, under favourable conditions, result in some natural cross-fertilisation, which greatly increases the diversity of type. The consequence is the crop ripens unevenly, the heads of the field are not level, with the result that there is a percentage of loss in harvesting, and the sample of grain is not uniform.

Desirable Economic Characters.

These looked for in wheat may be given under four heads:—

(1) The farmer must have a variety that yields well, with straw strong enough for his climate, and no defects from the harvesting and marketing points of view.

(2) The miller requires a grain which grinds easily, yielding a large percentage of flour; the grain must be clean, plump, sound, unbleached, and free from smut, and with as little offal and chaff as possible. (Chaff adhering to the grain is often found with Federation.)

(3) The baker looks for a flour which makes the largest number of well-risen loaves of good texture, colour, and appearance from a given weight of flour, in other words, a flour of good "strength."

(1) The consumer cares little for the chemical composition of the loaf provided that it is palatable and digestible. It so happens, however, that bread of this character contains a sufficient proportion of gluten to make it a nourishing food. Bread is eaten as an appetising form of starch rather than as a source of protein. At the same time, a flour of at least moderate strength is required for people of small means who subsist largely on bread, and also for the increasing production of machine bread. Professor Wood, in England, has lately discovered that the gluten of a strong flour contains a large proportion of phosphates, and experiments have shown that by the addition of phosphoric acid a weak flour can be made into a dough which, instead of turning out a close, stodgy loaf, makes well-risen bread of light texture. The great difficulty with plant-breeders has been to associate high yield with high quality of grain; but if this process can be made a commercial success in machine baking, it will go far to reconcile the interests of the farmer and the consumer. Phosphates, of course, do not take the place of protein in bread from a nutritive standpoint; a sufficient percentage of gluten in a flour will be necessary as meat foods increase in price.

Weak Points in Varieties and Requirements of Districts.

In seeking to improve a variety one must take into account its behaviour in the district where it is to be grown. A wheat may hold its grain well enough and have sufficiently strong straw at Bathurst, but the same variety may shell out its grain and lodge when grown in the Wagga district. The chief defects in wheat are:—

Unproductiveness, often shown by a very lax, open ear, slender and tapering or "rat-tailed." It is a mistake to adhere to a preconceived idea in breeding as regards type of ear; some of the dense club-shape are not so productive as a medium dense ear of the cigar-shape. Comparative weights of grain at harvest time are the safest guide.

Shattering or shaking is a bad fault, especially in districts exposed to high winds, and where the harvester or stripper is used. In cool climates where the binder is employed this defect is not so serious. In such varieties the chaff enclosing the grain is thin, standing partly open at maturity, and the grain is easily dislodged. Some of our most productive varieties are of this type.

Weakness of straw is a common defect, often, but not always, associated with early maturity. There are varieties in which the straw is slender and brittle at a point just below the head; with wind at harvest time many of the heads snap off. Some of the Purple Straw family are of this type. Others have straw of poor quality, but stiff enough to support the heads in most seasons, such as Bunyip. In the variety Gluyas Early the straw is rather too slender to support the heavy ears in a good season. A variety such as Jade, which lodges easily, should be sown on upland rather than alluvial soil.

Frost and Drought susceptibility.—These two qualities are sometimes confused. Cold winds coming about flowering time, or soon after, often cause more damage than frosts. Some varieties are subject to frosting—Bomen is one of these—and any early-ripening wheat sown too early will usually succumb to frost.

Liability to Disease.—This is often indicated by a heavy foliage, broad limp leaves which lack the bluish tint seen in wheats of vigorous constitution. Varieties differ greatly in their susceptibility to rust. In certain districts this pest is always to be reckoned with, and rust-liable varieties should be avoided. Over most of the wheat belt, however, rusty seasons are of rare occurrence, and as the most productive varieties are rust-liable, it often pays the farmer to grow these and risk a rusty year instead of adopting a rust-resistant wheat of moderate yielding capacity.

Too abundant stooling.—This is a common defect with varieties imported from Europe and America. These may be exceedingly productive in their own country, but too late in maturing for our climate. Australian wheat owes its superiority to a moderate rainfall during growth, and dry, warm harvesting weather. Varieties which stool profusely are unable to fill their ears with plump grain under those conditions, and the result is the grain becomes shrivelled and the ear tip withered.

A large proportion of straw to grain.—Sometimes farmers favour a variety for stripping which, on account of its bulky character, would pay better to cut for hay.

Poor milling qualities.—Before growing a new or introduced variety largely, it is wise to have the grain examined in the Departmental testing mill, because it is impossible to gauge the flour quality accurately by mere inspection of the grain.

Breeding Stock.

It is important that a breeding station should have pure stocks of seed of the best varieties. Stocks whose pedigree can be traced back to a single individual, and which have been bred true to type, are of great value. Their characters and attributes are familiar, and when crossed we know just what to expect in the progeny. When we are thoroughly acquainted with the characteristics of the varieties in cultivation, a departure from type or a natural crossbred can be more easily detected, and either destroyed or selected for separate propagation if it looks promising. Such stocks are what Johannsen calls "pure lines," and their pedigree culture "line-breeding." The best looking individuals are not by any means always the best for breeding; this fact is known to animal breeders. One would rather have an ordinary-looking plant from a pure stock known to be productive than a heavy-yielding individual from a field crop of mixed strains of the same variety. Too much is sometimes expected from seed introduction. It often takes a few years to isolate a strain which is thoroughly adapted to the district where the wheat is to be grown. On the same principle, farmers are not well advised to obtain seed from a different district if it can be avoided. We have never known superior yields to result from this practice where the home-grown seed was pure-bred stock adapted to the district. This will be referred under "Selection." The introduction of a better variety is another matter.

(*To be continued.*)

Notes on the Wheats at the Royal Agricultural Society's Show.

Easter, 1915.

F. B. GUTHRIE.

Owing to the disastrous drought which affected most of the wheat-growing areas of the State in 1914, and no doubt also, in a secondary degree, owing to the uncertainty caused by the war, the entries in the wheat section of the Royal Show fell off considerably last Easter; the number of entries being only 57 as against 91 in 1914.

The quality of the grain exhibited made up, however, for lack in quantity, and there has never been a show at which the exhibits were of such a uniformly high standard; the judges having considerable difficulty in apportioning the prizes among competitors of high and nearly equal merit. The high bushel-weights, which was the feature of last year's show, were well maintained this year. One sample of Cedar weighed 69½ lb. to the bushel—a weight which must surely constitute a record. It is certainly the highest that has come under my notice.

Both in bushel-weight and in flour-strength, the average was the highest yet reached by the wheats exhibited at the Royal Show. It is worth noting that, although the bushel-weights of these wheats were phenomenally high, the f.a.q. standard for this season was lower than last year. This is no doubt due to the fact that only the finest selected grain is entered for competition, whereas the f.a.q. sample contains much inferior grain.

The judges were Messrs. R. W. Harris (of Gillespie Bros.) and Mr. G. W. Norris (of the Chemist's Branch, Department of Agriculture); and Mr. G. W. Norris carried out the milling of the samples.

The Judges' Report.

"A most remarkable feature in connection with the wheat exhibits, is the continual improvement from year to year. In spite of the severe drought, never before have there been such remarkably heavy wheats, producing flour with record strength, at the Royal Show; in fact, it is doubtful if similar results have ever been obtained in the wheat-growing history of Australia. Speaking of the individual classes, the Red Wheat class has a record entry of nine, all of which are champions, so to speak; the lightest weighing 66 lb. per bushel, and the heaviest 69½, which is the record weight for the Royal Shows.

The Australian Strong White section is also a splendid collection, there being as many as in the best previous years, with appearance probably better, and worthy of the title of Australian Strong White. The sample exhibited

by Mr. Smith Pollock for the prize for the best bag of Comeback, is undoubtedly a wonderful strain of that variety, yielding a large percentage of flour of remarkably good quality; in fact, it is the strongest Comeback ever exhibited at a Sydney Show."

The Prize-winners.

Mr. Smith Pollock, of Quirindi, was again the most successful exhibitor, annexing the Champion prize for the best bag of wheat exhibited, with a sample of Cedar, and three first prizes, as well as the Special prize for the best bag of Comeback.

Mr. Scholz, of Gilgandra, ran Mr. Smith Pollock fairly close, obtaining the Special prize for the collection of Farrer and non-Farrer wheats, as well as one first and two seconds in other classes.

Mr. W. Clark, of Angle Vale, South Australia, divided the first prize in the Macaroni class with a sample of Indian Runner. Mr. Clark has exhibited this variety for many years past, and has been a consistent prize-winner, and is to be congratulated on his repeated successes.

The Champion Prize.

The Champion prize for the best bag of wheat exhibited, was again awarded to a sample of Cedar, for the fourth year in succession. There has been a considerable amount of controversy in the Press as to the advisability of giving the Champion prize to a wheat which is less prolific than others—in some localities, at least—and there is a feeling among many that more encouragement should be given to good yielding varieties, even if they are less good as milling samples. As I pointed out in the notes on the wheats shown at the Royal Agricultural Show, Easter, 1914 (published in the *Agricultural Gazette* for July, 1914), it is only practicable to judge according to the commercial value of the wheats. If the prize were awarded for prolificness, there would be no need for the wheat to be judged, nor for the samples to be exhibited; a mere statement, properly verified, being all that would be required. There is, however, much force in the contention that it is anomalous to assign the Champion prize to a wheat that is very little grown, and which probably never will be grown extensively in the Southern wheat-producing areas.

The Society has given the matter careful consideration, and it has been thought best to omit the "Champion Prize for the best bag of wheat exhibited" from the schedule, and to encourage the donation of special prizes for specific varieties, such as Cedar, or Comeback, or Federation, &c. It is obvious that if the championship is to be awarded to the best bag of wheat, it must be judged on the commercial basis or from the miller's standpoint, and in this case, the soft, weak wheats, or the macaroni wheats, cannot hope to compete with wheats of the Cedar class (Hard Red), or of the Strong White class. It is hoped that this decision will commend itself to exhibitors.

The accompanying table shows the milling quality of the wheats of the "Strong White" and of the "Soft White" classes since 1905.

It will be seen that bushel-weight, gluten-content, and flour-strength, tend to increase year by year, especially in the "Strong White" class.

TABLE showing average bushel-weights, gluten content, and water absorbing power of Wheats ("Strong White" and "Soft White"), milled at the Royal Agricultural Society's Shows from 1905–1915.

Year.	Weight per bushel.		Gluten.		Flour Strength (Water absorption, quarts per 200 lb. sack.)	
	Strong White.	Soft White.	Strong White.	Soft White.	Strong White.	Soft White.
	lb.	lb.	per cent.	per cent.	per cent.	per cent.
1905	63	64	10·0	9·7	46·6	45·2
1906	63¾	64½	11·0	9·8	48·5	45·7
1907	62½	66	9·3	8·3	48·4	45·4
1908	64½	65	12·2	10·2	52·5	46·4
1909	64¾	65¼	11·9	8·6	53·5	49·2
1910	64½	64	13·8	12·1	50·0	47·8
1911	64½	63½	12·5	11·0	53·4	47·0
1912	65	64	13·4	10·6	52·7	45·2
1913	67	65¼	15·2	11·7	53·1	46·9
1914	67¾	67	12·8	10·6	52·3	45·0
1915	67½	66½	13·1	12·4	53·8	45·7

The judging was carried out as in previous years. The bushel-weight of all the samples was taken, and the results are given in the first of the tables which follow.

After careful inspection, to eliminate the inferior exhibits, those which were considered eligible for prizes were milled on the small model mill of the Department of Agriculture, and the prizes were finally awarded in accordance with their actual behaviour in the mill, marks being assigned to the different milling characteristics. The results of these tests are given in the table headed "Results of Milling Tests," in which the figures within brackets give the actual milling results, the other figures being the marks obtained.

WEIGHTS PER BUSHEL.

Catalogue No.	Variety.	Bushel weight.	Catalogue No.	Variety.	Bushel weight.
	Class 791 (Macaroni Wheat)				
4216	Indian Runner	64·9	4247	Medeah	64·1
	Class 792 (Strong Flour Red)				
4248	Cedar	68·2	4253	Cedar .	68·9
4249	"	66·8	4254	"	69·5
4250	"	66·2	4255	" ..	67·9
4251	"	67·8	4256	"	65·9
4252	"	67·0			
	Class 793 (Australian Strong White).				
4257	Comeback	67·6	4261	Comeback .	67·0
4258	"	66·0	4262	" ..	68·4
4259	"	67·0	4263	Bobs	67·3
4260	"	66·2	4264	Comeback	66·8
	Class 794 (Medium Strong).				
4272	Yandilla King	—	4278	Bayah	67·9
4273	Coronation	—	4279	Bomen . . .	68·6
4274	Florence	67·8	4280	Florence	67·9
4275	Bunyip	67·8	4281	Bunyip	67·4
4276	Tarragon	66·5	4282	Bayah	[illegible]
4277	Bunyip	—	4283	Yandilla King	65·7

WEIGHTS PER BUSHEL—*continued.*

Catalogue No.	Variety.	Bushel-weight.	Catalogue No.	Variety.	Bushel-weight.
	Class 795 (Weak Flour).				
4288	Warren	65·2	4291	Plover	66·2
4289	„	67·6	4292	Warren	65·7
4290	„	67·9			

RESULTS OF MILLING TESTS.

	Appearance of Grain.	Weight per bushel.	Ease of Milling.	Percentage of Flour.	Colour of Flour.	Percentage of dry Gluten.	Strength.	Total.
Maximum Marks.	10	15	10	10	15	20	20	100
Catalogue No.	**Class 792 (Strong Red).**							
4252	10	[67·0] 14	9	[71·3] 9	15	[15·1] 18	[55·8] 19	94
4248	8	[68·2] 15	9	[74·0] 10	14	[12·3] 15	[59·4] 20	91
4254	9	[69·5] 15	9	[69·0] 8	13	[12·8] 15	[51·6] 16	85
	Class 793 (Australian Strong White).							
4261	10	[67·0] 14	9	[74·8] 10	13	[14·9] 18	[57·4] 19	93
4262	10	[68·4] 15	9	[73·9] 10	12	[12·8] 15	[53·6] 17	88
4259	9	[67·0] 14	9	[74·4] 10	12	[12·5] 15	[51·4] 16	85
4257	8	[67·0] 14	9	[74·0] 10	11	[12·4] 15	[53] 17	84
	Class 794 (Medium Strong Flour).							
4276	10	[66·5] 14	10	[75·0] 10	13	[15·1] 18	[53] 17	92
4280	10	[67·9] 15	10	[73·4] 10	12	[14·6] 17	[49] 15	89
4278	10	[67·9] 15	10	[71·0] 9	14	[13·0] 16	[44] 13	87
4281	10	[67·4] 14	10	[71·3] 9	15	[11·5] 14	[40·8] 14	86
	Class 795 (Weak Flour).							
4290	10	[67·9] 15	10	[72·3] 9	14	[11·8] 14	[47] 16	88
4289	10	[67·6] 15	10	[71·1] 9	14	[11·4] 14	[46] 15	87
4291	9	[66·2] 13	10	[72·4] 9	15	[14·0] 17	[44] 13	86
	Special Prize for best Bag of Federation.							
4286	9	[66·6] 14	10	[73·8] 10	15	[11·6] 14	[48] 17	89
4285	10	[67·4] 14	10	[75·4] 10	14	[12·7] 15	[45·2] 14	87
4284	8	[64·8] 12	10	[73·2] 10	12	[13·4] 16	[44] 13	81

SPECIAL PRIZES FOR THE BEST COLLECTION OF FIVE FARRER WHEATS.

Catalogue No.	Variety.	Bushel-weight.	Seed per acre.	Yield per acre.	Rainfall during Growth.	Appearance Points.	Soil, &c.
			lb.	bus.	inches.		
4296 First Prize.	Cedar	69·1	28	19	4·5	10	On sandy loam; autumn ploughing.
	Comeback ...	68·1	28	16	4·5	10	
	Bomen	68·6	28	19	4·5	9	
	Warren	67·9	28	17	4·5	10	
	Jade	69·0	28	15	4·5	10	
	Average ...	68·54			Total...	49	
4295 Second Prize.	Comeback ...	67·3	45	18	7	9	Sandy loam; autumn ploughing.
	Cedar	67·9	45	15	7	10	
	Bayah	67·6	45	18	7	10	
	Warren	67·4	45	18	7	10	
	Federation ...	65·3	15	22	7	10	
	Average ...	67·5			Total...	49	
4294	Cedar	67·4	45	18	9·47	8	On red soil; autumn ploughing.
	Bobs	66·3	45	19	9·47	10	
	Comeback ...	66·8	45	18	9·47	10	
	Jonathan	66·8	45	15	8·76	10	On black soil; autumn ploughing
	Bunyip	65·4	45	20	8·76	10	
	Average ..	66·45			Total...	48	
4297	Comeback ...	67·4	45	20	9	10	On black soil; autumn ploughing.
	Cedar	67·4	45	21	9	10	
	Bobs	67·1	45	24	9	10	
	Warren	66·0	45	22	9	8	
	Bunyip	67·1	45	25	9	10	
	Average ...	67·0			Total...	48	
4298	Firbank	66·6	60	9	5·55	9	Autumn ploughing.
	Warren	63·9	60	9	5·55	9	
	Cedar	65·7	60	16	5·55	7	Fallow.
	Florence	65·4	60	8	5·55	9	Autumn ploughing.
	Jumbuck	64·2	60	12	5·55	7	Fallow.
	Average ...	65·16			Total...	41	
4293	Cedar	67·9	55	15	2·1	7	On red soil; autumn ploughing.
	Bobs	67·8	60	12	2·1	9	
	Comeback ..	66·3	60	13	2·1	7	
	Bunyip	67·3	50	18	2·1	9	
	Florence	67·6	55	15½	2·1	8	
	Average ..	67·3			Total	38	

SPECIAL PRIZE FOR BEST COLLECTION OF FIVE NON-FARRER WHEATS.

Catalogue No.	Variety.	Bushel-weight.	Seed per acre.	Yield per acre.	Rainfall during Growth.	Appearance Points.	Soil, &c.
			lb.	bus.	inches.		
4301 First Prize.	Purple Straw ...	68·2	28	19	4·51	10	On red loam; autumn ploughing.
	Marquis	67·1	28	18	4·51	9	
	Red Fife	67·8	28	14	4·51	10	
	Marshall's No. 3...	67·5	28	18	4·51	9	
	Petatz Surprise ...	67·8	28	16	4·51	10	
	Average ...	67·68			Total...	48	
4300	Purple Straw ...	67·0	45	21	7	10	On sandy loam; autumn ploughing.
	Petatz Surprise ...	67·4	45	18	7	10	
	Smart's Early ...	67·3	45	15	7	10	
	Marquis	67·0	45	18	7	8	
	Zealand	66·3	45	18	7	8	
	Average ...	67·0			Total...	46	
4299	Marquis	65·1	45	18	9·47	8	On red soil.
	Budd's Early ...	67·1	45	16	9·47	10	On sandy loam.
	Gluyas Early ...	66·3	45	17	9·47	8	On black soil.
	Petatz Surprise ...	67·0	45	18	9·47	10	On sandy loam.
	Purple Straw ...	66·0	45	20	9·47	8	On sandy loam.
	Average ...	66·3			Total...	44	
4302	Yandilla King ..	65·7	45	40	9	9	On black soil.
	Marshall's No. 3...	64·1	45	27	9	8	
	Petatz Surprise ...	65·7	45	18	9	9	
	Zealand	64·2	45	23	9	8	
	Australian Talavera.	67·0	45	20	9	10	
	Average ...	65·3			Total...	44	

Awards.

Class 791— Macaroni.

First Prize, divided between No. 4246—Wm. Clark; Indian Runner; grown at Angle Vale, South Australia, on sandy soil; seed per acre, 1 bushel; yield per acre, 4 bushels; fallow.

No. 4247—Smith Pollock; Medeah; grown at Glengarry, via Quirindi, on black soil; seed per acre, 45 lb.; yield per acre, 18 bushels; rainfall during growth, 9·47 inches; autumn ploughing.

Class 792— Strong Flour (Red).

First Prize, No. 4252—Smith Pollock; Cedar; grown at Glengarry, via Quirindi, on red soil; seed per acre, 45 lb.; yield per acre, 21 bushels; rainfall during growth, 9·47 inches; autumn ploughing.

Second Prize, No. 4248—Wm. Bridge; Cedar; grown at Borambil on red gravelly soil; seed per acre, 50 lb.; yield per acre, 15 bushels; rainfall during growth, 7 inches; autumn ploughing.

Awards—*continued.*

Class 793— Australian (Strong White).	First Prize No. 4261—Smith Pollock, Comeback; grown at Glengarry, via Quirindi, on red soil; seed per acre, 45 lb.; yield per acre, 18 bushels; rainfall during growth, 9·47 inches; autumn ploughing. Second Prize No. 4262—W. H. Scholz, Comeback; grown at Gilgandra on red loam; seed per acre, 28 lb.; yield per acre, 16 bushels; rainfall during growth, 4·51 inches; autumn ploughing.
Class 794— Medium Strong Flour.	First Prize No. 4276—Alfred J. Pankhurst, Tarragon; grown at Duri on chocolate soil; seed per acre, 40 lb.; yield per acre, 8 bushels; rainfall during growth, 4·3 inches; autumn ploughing. Second Prize No. 4280—W. H. Scholz, Florence; grown at Gilgandra on red loam; seed per acre, 28 lb.; yield per acre, 15 bushels; rainfall during growth, 4·51 inches; autumn ploughing.
Class 795— Weak Flour.	First Prize No. 4290—W. H. Scholz, Warren; grown at Gilgrandra on red loam; seed per acre, 28 lb.; yield per acre, 17 bushels; rainfall during growth, 4·51 inches; autumn ploughing. Second Prize No. 42·89—J. B. Roach, Warren; grown at Gilgandra on sandy loam; seed per acre, 45 lb; yield per acre, 18 bushels; rainfall during growth, 7 inches; autumn ploughing.

SPECIAL PRIZE for the best bag of Federation Wheat.

No. 4286—Wm. Tonkin; grown at Little Plain, Delungra, on black soil; seed per acre, 45 lb.; yield per acre, 28 bushels; rainfall during growth, 9 inches; autumn ploughing.

SPECIAL PRIZE for best bag of Comeback.

No. 4269—Smith Pollock, same wheat as exhibited in Class 793, No. 4261.

CHAMPION PRIZE for best bag of Wheat exhibited.

No. 4252—Smith Pollock; Cedar; same wheat as exhibited in Class 792.

SPECIAL PRIZES for best collection of five Farrer Wheats.

First Prize No. 4296—W. H. Scholz; grown at Gilgandra.
Second Prize No. 4295—J. B. Roach; grown at Gilgandra.

SPECIAL PRIZE for best collection of five Non-Farrer Wheats.

No. 4301—W. H. Scholz; grown at Gilgandra.

Fungus and other Diseases of Stone Fruits.

[Continued from page 598.]

G. P. DARNELL-SMITH, B.Sc., F.I.C., F.C.S., Biologist; and
E. MACKINNON, B.Sc., Assistant Biologist.

RUST.

THE disease known as Rust is world-wide, and attacks all the cultivated stone fruit trees (species of the genus *Prunus*). It has been known for over twenty-five years in the Australian States, from Queensland to South Australia inclusive. Rust is most prevalent towards autumn, but is common from November to June. In some seasons it appears in the early summer. It varies with the nature of the season, and is intermittent in character. Moisture in the early spring and summer encourages its development. It is much more destructive in relatively warm, moist climates. The later in the season it appears, the less damage it does.

The most generally observed effect of an attack is the premature shedding of the leaves. At first there is no striking discolouration of the leaves, but later the upper surface shows yellowish spots irregularly scattered, which often run together, and the under-surface shows brown to reddish powdery patches. If the leaf (especially that of the peach and apricot) is held up to the light, the yellow patches show clearly by transmitted light. (Fig. 1.) Later,

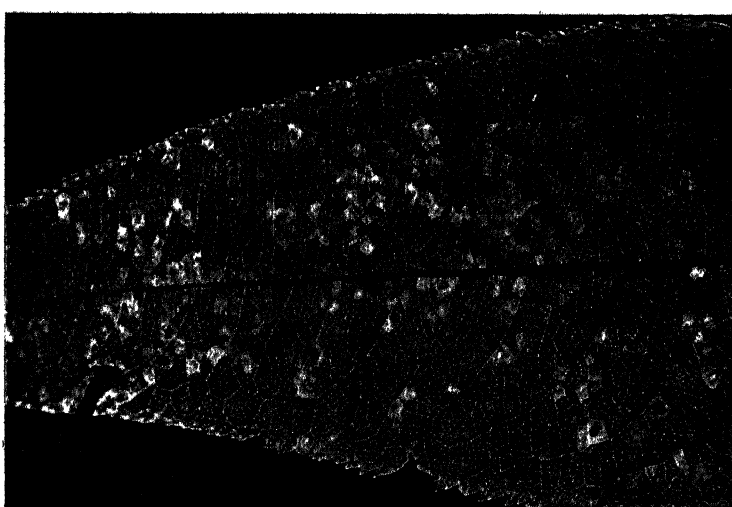

Fig. 1.—Peach leaf photographed by transmitted light, and slightly enlarged (×?) to show the yellow spots produced by the rust

the whole becomes a sickly yellow colour, and soon falls. This is often mistaken for the usual autumn falling, as the attack so often produces the defoliation in autumn. On account of the colour changes also, the disease has been frequently referred to as Peach Yellows. This is apt to lead to confusion with another disease known in many parts of the United States of America as Peach Yellows. The cause of this American disease, which is apparently confined to U.S.A. and Ontario (Canada), is not definitely known, but it is a most destructive disease and is spread chiefly by nursery stock budded from places where "Peach Yellows" exists, and by diseased seedlings. It is of very great importance for the grower to watch for the appearance of any unusual symptoms, and to obtain expert advice and assistance from the Department without delay.

The shedding of the leaves with Rust begins towards the base of a branch, often leaving a somewhat tufted appearance at the top. Defoliated trees are unable to properly mature the fruit they carry at the time of attack, hence it often becomes toughened and falls in an immature condition. The fruit may be directly affected by the fungus. (Fig. 2.) Spots and scabs may be produced, or the fruit may become hard and rough, and even split.

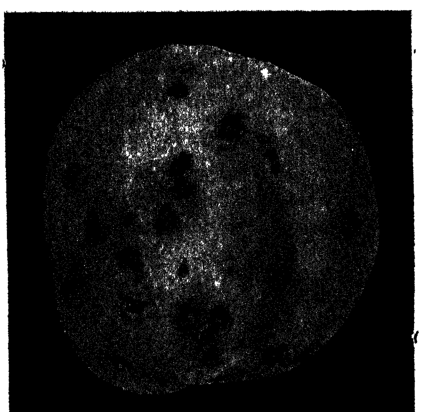

Fig. 2. - Apricot showing spots due to rust.

Such are the immediate visible results, but there is a further injurious effect not so evident. The fungus may enter the young twigs and branches as well as the leaves and fruit. This is more common in young trees. As peach trees form fruit on the previous season's wood, any injury to the young twigs may seriously affect the succeeding year's crop. With the failure of a fruit crop, the energies of the tree may result in new growths out of season, with the possibility of winter injury and sun burning. Thus there is a cumulative injurious effect. In rapidly growing nursery stock the bark may be ruptured.

The Cause of Rust.

The cause of the Rust is a parasitic fungus known as *Puccinia pruni-spinosæ* (*Persoon*). The Australian records of the hosts and parts attacked are as follow :—

Peach	Leaf, fruit, stem.
Almond and Apricot	Leaf, fruit.
Plum and Nectarine	Leaf.

Outside Australia it is also recorded on cherry trees. Most rusts pass through several stages in their complete life development, and each period is marked by a particular kind of spore. With *Puccinias*—such as those of peach, wheat, and oats—there are at least three well-known stages, the first being developed on a different kind of plant to that of the second and third. The first form (the æcidium, or cup stage) is not always developed, and is not essential for the propagation of the fungus. In New South Wales, with peach rust, we have the spores of the second and third stages only, known respectively as Uredospores and Teleutospores. These spores are produced in small patches, known as sori, and they burst through the epidermis almost wholly on the under-surface of the leaf, giving it the powdery appearance already mentioned. They are sometimes so numerous as to cover the whole of the under-surface with a deposit like fine dust. The first kind produced are the Uredospores (Fig. 3U), which occur on all the hosts. They are minute

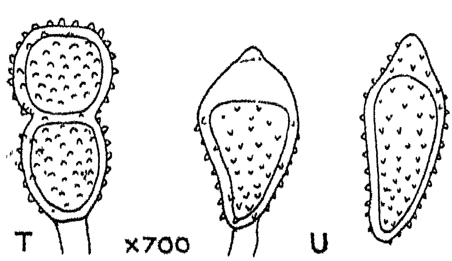

Fig. 3.—Teleutospore and Uredospores of Rust.

(up to one-sevenhundredth of an inch long), pale brown, and covered with sharp-pointed warts. Later in the season the Teleutospores (Fig. 3T) are developed in groups in the same sori amongst the Uredospores. They are comparatively rare on apricot and peach leaves, less so on almond leaves, and very common on plum leaves. They are slightly larger than the Uredospores, and consist of two globular halves which readily separate, and are covered with blunted warts. Their development commonly occurs about March. Both kinds of spores may germinate, and are capable of producing infection. They are able to remain alive through the winter, and produce infections in the beginning of spring, if conditions are favourable.

Treatment.

Since stem, leaves, and fruit are attacked, all such affected parts should be destroyed, so as not to carry the spores through the winter. As in the case of Brown Rot and Leaf Curl, a thorough spraying with Bordeaux (6—4—22) should be given before the buds burst, as the rust spores are then preparing to germinate, and are most readily killed, or the young germ tubes are destroyed by the spray deposit. Further spraying with lime-sulphur should be given, depending on the weather conditions. In all the diseases mentioned, the strong Bordeaux cleansing spray is most important.

PEACH FRECKLE, OR BLACK SPOT.

In the moister, warm peach districts the fruit is often disfigured by the disease known variously as Freckle, Black Spot, or Scab. This disease was first reported as a serious one in Austria, and the fungus causing it described under the name *Cladosporium carpophilum* (Thuemen). It is now found throughout the United States, parts of Canada, South Africa, and New South Wales. It has been estimated that this disease is the cause of a loss of 10 per cent. of the total value of the peach crop in the United States. It is known to affect all stone fruits, but in New South Wales, as in South Africa, it is the peach that is mostly attacked. It is sometimes common in January and February, the late peaches being more liable to attack, as the development of the fungus is apparently slow. We also have it on apricots. It first makes its appearance in the form of small, round, green spots, which quickly increase in number. They are nearly always much more abundant on one side, and develop near the stalk end. The side exposed to the sun is the worst affected as a rule, and the spots soon coalesce, forming large dark coloured patches. (Fig. 4.) The parts of the fruit attacked become tough and

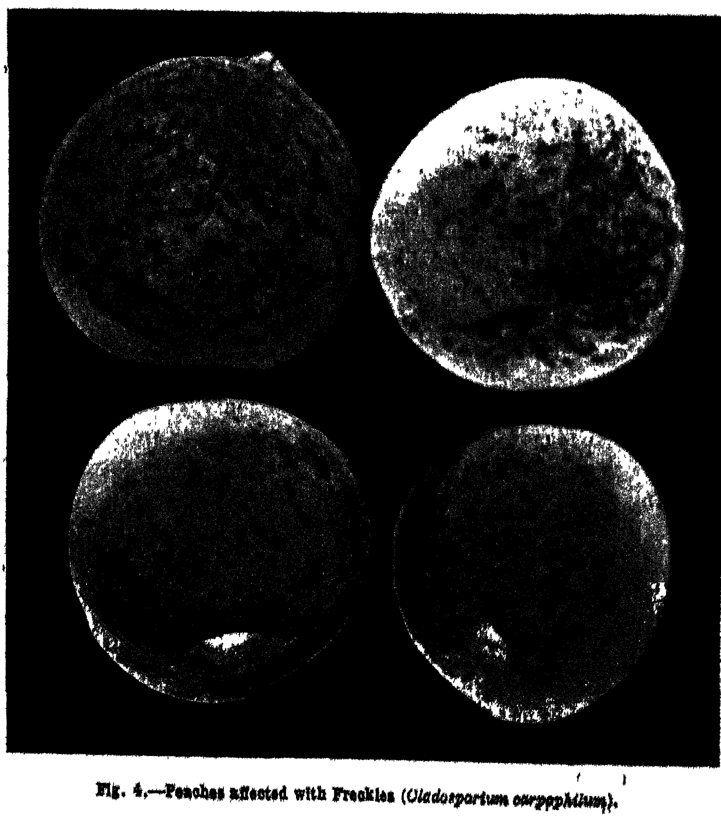

Fig. 4.—Peaches affected with Freckles (*Cladosporium carpophilum*).

hardened, and frequently cracked. Thus it becomes an easy prey to various agents of decay, such as the Brown Rot fungus. Partly-grown fruit, when attacked, may fall prematurely. On account of the resemblance to the apple disease, due to *Fusicladium*, this disease is also called Scab. The fungus itself is similar to *Fusicladium*, and it likewise attacks all parts—twigs, leaves, and fruit. On the leaves, circular spots are formed, and the central dead tissue falls out, producing a shot-hole appearance. On the twigs, brown areas are formed, and in the diseased cortex the mycelium lives through the winter. In the following season this starts into active growth, and brown two-celled spores are produced, which are the chief source of infection for the fruit.

The winter cleaning with Bordeaux; followed by lime-sulphur, as for Brown Rot, effectively controls this disease.

(*To be continued.*)

The Influence of Infusorial Earth on Plant Growth.

A correspondent recently brought under the notice of the Department the fact that at Pambula a large plot of fine green grass was noticed during the recent drought. The dimensions of the plot coincided with those of a deposit of infusorial earth. "This infusorial earth is the lightest mineral known, 1 cwt. filling a large cask. It absorbs nearly twice its weight of water, and is naturally 'as fine as silk' when crumbled between the fingers. It is chiefly composed of calcium silicate, and like kieselguhr, is formed by deposits of microscopic shells. While the calcium has its manurial value, I would think that the reason the grass grew well was the power the earth had to absorb and retain the dew sufficiently long to keep the grass alive. The droppings of the stock that collected there would, of course, provide sufficient nitrogenous matter to help. Infusorial earth can be obtained easily and cheaply, and I recommend it to your notice as a possible factor in dry farming."

In commenting upon this, the Chemist to the Department stated that the experience with diatomaceous earth was interesting, and the explanation appeared a reasonable one. At the same time it was a question whether infusorial earth could not be more profitably disposed of, as it had a market value in the production of dynamite, polishing powder, &c. In Pittman's "Mineral Resources of New South Wales," it is stated that some was exported in 1896, and realised 3s. 6d. per bushel. If there was any large area of it at Pambula it should have a commercial value.

A Descriptive Catalogue of the Scale Insects ("Coccidae") of Australia.

[Continued from page 615.]

WALTER W. FROGGATT, F.L.S., Government Entomologist.

Genus XXV. *Lichtensia*, Signoret.

Ann. Soc. Ent. France (5), vol. iii, p. 27. 1873.
Newstead, *Monog. Brit. Coccidæ*, vol. ii, p. 32. 1902.
Cockerell, *Canadian Entomologist*, vol. xxxi, p. 331. 1899.

THE members of this genus according to Newstead have naked, more or less active females, until they commence to deposit their eggs, when they envelop themselves in a closely felted white sac with an opening on the dorsal surface of the cephalic extremity. The antennæ and legs are well developed. Newstead says: "This genus comes very near to the preceding in the structural details of the adult female, and also in the form of the ovisac, but may be readily separated from *Signoretia* by the long caudal filaments of the male and the curious anteriorly bifurcate character of the coronet of the male puparium." Cockerell says: "Body oval or sub-oval, like a *Pulvinaria*; ovisac produced posteriorly, often felted, usually leaving the cephalic end of the insect more or less exposed."

About eight species are recorded from Brazil, Mexico, Egypt, Europe, and one from Australia.

Lichtensia hakearum, Fuller. (Plate XVI, fig. 1.)

Lecaniodaspis hakearum. *Journal Bureau of Agriculture, W. Australia*, p. 1345. 1897.
Lichtensia hakearum. *Trans. Ent. Soc., London*, p. 451, pl. xv, f. 37. 1899.

Found upon the branchlets of *Hakea ilicifolia* and another undetermined species, at Pinjarrah, West Australia.

Adult female forming a spherical rounded sac of closely felted white secretion, fitting close to the bark, rising up into a rounded cap, with an elongate opening on the median region of the dorsum. Length at base about $\frac{1}{8}$ of an inch, and nearly $\frac{1}{7}$ of an inch in height.

Adult female very convex on under-surface, convex on dorsal surface, broadly oval, light reddish brown; boiled in potash giving out a dull red tint. Anal segment deeply arcuate in the centre, with the two edges folding over below the cleft. Anal ring small with six hairs. Antennæ 7-jointed, long, third very long and slender. Legs long with the tibiæ long and slender, tarsal claw short. Epidermis covered with well-defined multilocular spinnerets.

705. *Austrolichtensia hakearum*. Cat. Coccidæ, p. 142.

Genus XXVI. *Lecanopsis*, Targioni-Tozzetti.

Rhizobium. Targ., *Studii sul Cocci*, p. 23. 1867.
Targ. *Catalogue*, p. 36. 1869.
Sign., *Ann. Soc. Ent., France* (5), vol. iv, p. 93. 1874.

The members of this genus are subterranean in their habits, living on the roots of plants like some of the members of the genus *Dactylopius*, but are easily distinguished from members of the latter genus by the lecanid abdominal cleft, in the anal lobes, and in having six-jointed antennæ. The legs are present, but small and usually aborted, mentum monomerous. Four species have been recorded from Europe and North America, and one from Australia. Cockerell removed our species from this genus and created a new genus *Alecanopsis*, making *A. filicum* the type; as far as I can see the reasons given are only colour, and the more convex and rugose form of the adult coccid. The convexity and deeper segmentation of the abdomen seem doubtful generic characters unless a series of specimens have been examined by the creator of the new genus.

Lecanopsis filicum, Maskell.

Proc. Linn. Soc. N. S. Wales, vol. 8 (2nd ser.), p. 225, pl. vii, fig. 1-4. 1893.
Cockerell, *Canadian Entomologist*, vol. xxxiii, p. 58. 1901.

The type was found upon the roots of *Doodia aspera* (fern) growing on the Kurrajong, near Richmond, New South Wales.

Adult female dark reddish brown, general form turbinate with the undersurface slightly concave, the cephalic portion smallest, smooth, with the rostral plate large and rounded. Antennæ short, rather thick, conical, six-jointed. Feet short, rudimentary, joints swollen. Abdominal portion broadest, rounded at apex, distinctly segmented and very convex; the anal segment rounded on either side, with distinct anal clefts and lobes.

In Maskell's description no measurements are given; my specimen, taken on the roots of the same species of fern near the original locality, is $\frac{1}{8}$ inch in length, and $\frac{3}{10}$ inch across the abdomen, with a height of $\frac{1}{4}$ inch. These measurements do not agree with Maskell's description, as he says "the height being equal to the length."

1021. *Alecanopsis filicum*. Cat. Coccidæ, p. 211.

SUB-FAMILY 3.—*Dactylopiinæ*.

The coccids belonging to this group may be defined as scale insects not forming shield-like scales as in the diaspids, or naked like the lecanids, but at the adult stage protected or covered with a waxy, felted cottony, floury, or woolly coat, usually fitting close over the dorsal surface of the full-grown female, and as she shrivels up after egg laying, forming a cavity under which the larvæ are hatched and protected until they emerge. They are active in some cases in their earlier stages of development, but stationary when fully developed. Though some species are popularly known as "mealy

bugs," the members of the typical genus *Dactylopius* differ from the true "mealy bugs" (*Monophlebinæ*) in being enveloped in, or resting upon a pad or cushion of woolly filaments instead of producing the woolly ovisac behind their bodies.

The male tests, like those of the lecanids, differ in form and structure from those of the females, being often slipper-shaped, ribbed or corrugated with the truncated anterior portion adapted for the escape of the perfect winged male.

The adult females are more or less broadly oval, with or without legs, antennæ usually well developed, but sometimes aborted. The body is slightly segmented with the anal segment furnished with a pair of rounded, small, and not very prominent anal tubercules each bearing a bristle; the anogenital ring usually large and well defined. Cockerell, in his classification, divides the dactylopid coccids into five tribes, places them all in the sub-family *Coccinæ* and makes the *Dactylopiinæ* the last tribe.

In Mrs. Fernald's catalogue the gall-making coccids are placed in this sub-family. From a careful study of our peculiar forms I consider that they are entitled to a distinct division, and am therefore placing them in the sub-families *Brachyscelinæ* and *Idiococcinæ*.

The dactylopid coccids are well represented in Australia by many fine indigenous species peculiar to our flora, and other introduced species. Speaking generally, there are no very serious orchard pests found in this division in Australia, though some of our native plants and shrubs are sometimes badly infested, especially when the shrubs are grown from seeds and cultivated; as an example, *Eriococcus coriaceous*, though very common in the native forest on young gum-trees (*Eucalypts*), does little harm to them under natural conditions, but when infesting the cultivated gums in gardens or avenues does considerable damage. Introduced with young trees into New Zealand without its natural parasites in Australia this scale has done serious damage in their plantations.

The following genera are represented in Australia:—Genus XXVII *Asterolecanium*, XXVIII *Lecaniodaspis*, XXIX *Cerococcus*, XXX *Kermes*, XXXI *Rhizococcus*, XXXII *Gossyparia*, XXXIII *Eriococcus*, XXXIV *Pseudoripersia*, XXXV *Erium*, XXXVI *Dactylopius*, XXXVII *Pseudococcus*, XXXVIII *Ourococcus*, XXXIX *Epicoccus*, XL *Lachnodius*, XLI *Ripersia*, XLII *Antonina*.

Genus XXVII. *Asterolecanium*, Targioni-Tozzetti.

Introduction 2nd Mem. Studi. Cocc., Catalogue, p. 41. 1869.
Planchonia, Signoret, *Ann. Soc. Ent., France* (4), vol. x, p. 282. 1870.
Asterodiaspis, Signoret, *Bull. Soc. Ent., France* (5), vol. vi, p. ccix. 1876.
Green, *Coccidæ of Ceylon*, part iv, p. 311. 1909.
Newstead, *Monograph British Coccidæ*, vol. ii, p. 150. 1902.

The female coccid is completely enclosed in a box or sack-like structure (sometimes embedded in the soft tissue of the leaf or stem, with the top level

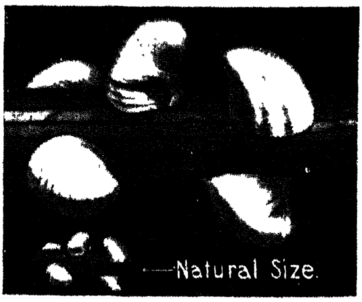

Fig. 1.—*Lichtensia hakearum.*

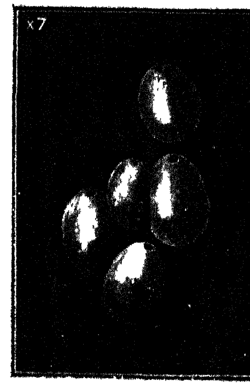

Fig. 3. *Asterolecanium quercicola.*

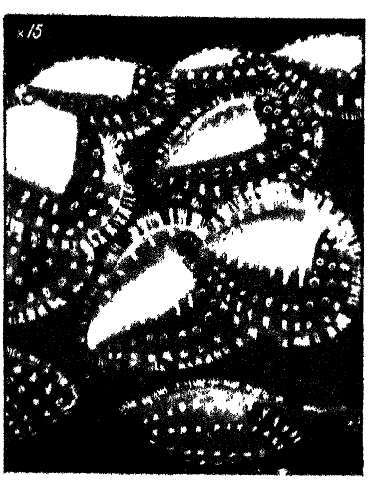

Fig. 2. *Asterolecanium fimbriatum.*

Fig. 4. *Asterolecanium styphelioe.*

SCALE INSECTS OF AUSTRALIA. PLATE XVI.

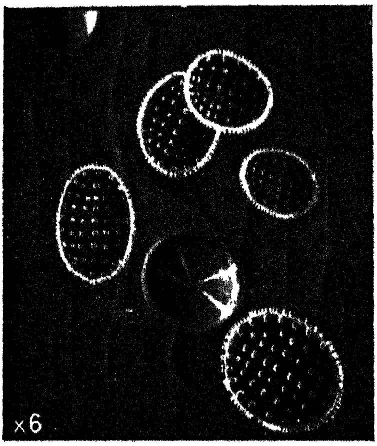

Fig. 1.—*Asterolecanium ventruosum.*

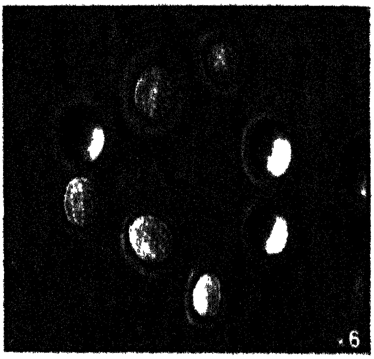

Fig. 2. *Asterolecanium ventruosum*
Small Variety.

Fig. 3.—*Lecaniodaspis acaciæ.*

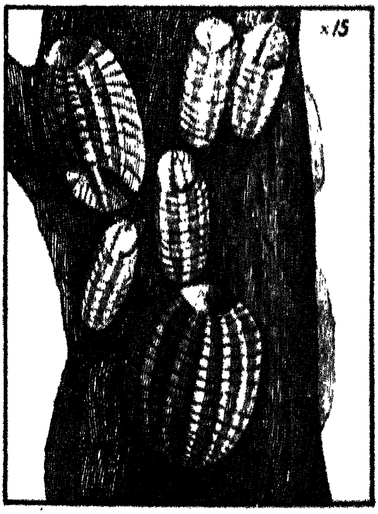

Fig. 4.—*Lecaniodaspis atherospermæ.*

SCALE INSECTS OF AUSTRALIA. PLATE XVII.

with the surface of the bark), composed of opaque, semi-transparent, glass-like, waxy or horny secretion, with the outer margins fringed with crystalline filaments or waxy spines. At the anal extremity there is a small opening, through which the young larvæ escape from the sac.

The enclosed adult coccids are legless, with antennæ wanting or else much aborted. The anal lobes are small and rudimentary, with the margins of the integument fringed with one or two rows of curled glands.

Maskell included all the species now placed under this genus in Signoret's Genus *Planchonia,* and was very critical about other writers on coccids not adopting it, but as this name *Planchonia* had been previously used in zoology, it had to be discarded.

Members of this genus are widely distributed, about twenty-six species have been described; but as several workers have relied chiefly upon size and colour without indicating the structural differences, several may have to be struck out.

Asterolecanium fimbriatum, Fonscolombe. (Plate XVI, fig. 2.)

Coccus fimbriatus, *Ann. Soc. Ent., France*, vol. iii, p. 209. 1834.
Planchonia fimbriata, Signoret, *Ann. Soc. Ent., France* (4), vol. x, p. 515. 1868.
" Maskell, *Trans. N. Zealand Institute*, vol. xxvi, p. 85. 1893.

This species is recorded from Europe and British Guiana, but Maskell has also identified it with the species he had sent to him from Queensland on *Leptospermum flavescens.* From Maskell's subsequent remarks he appears to think that our common species, which he called *Planchonia styphelicæ*, was identical or only a variety of the European species.

The adult female forms the typical yellow waxy test with the margins lighter; she has no legs or antennæ.

176. *Asterolecanium fimbriatum.* Cat. Coccidæ, p. 50.

Asterolecanium hakeæ, Fuller.

Planchonia hakeæ, *Journal Bureau Agriculture, W.A.*, p. 1345. 1897.
Asterolecanium hakeæ, *Trans. Ent. Soc., London*, p. 456. 1899.

This species was found on the foliage of *Hakea ilicifolia* and an undetermined species of *Acacia* near Perth, W.A.

Female test, light green, semi-transparent, flat, circular, no fringe. Diameter 0·06. Adult female margined with a fringe of figure-of-eight spinnerets, which are sometimes double. A single row of multicircular pores round the margin. Fuller, in his first notice, stated that this species was allied to *Planchonia ventruosa*, but in the second definition said it was allied to *A. quercicola.*

178. *Asterolecanium hakeæ.* Cat. Coccidæ, p. 51.

Asterolecanium miliaris, Boisduval.

Insectol. Agricole, 1869.
Signoret, *Ann. Soc. Ent., France* (4), vol. x, p. 281. 1870.
Green, *Coccidæ of Ceylon*, pt. iv, p. 338, pl. cxxix, figs 1-4. 1904.

This species is common upon the foliage and stems of the giant bamboos. It has been recorded from Algeria, Mauritius, Brazil, Jamaica, Trinidad and Ceylon. I found it all over the bamboos in the Botanic Gardens at Brisbane, Queensland. A second species with a very similar range (*A. bambusæ*) is also found on the bamboo, but is of a greener tint and much more circular in the form of the test; both are figured and described in Green's *Coccidæ of Ceylon*. He says that in Ceylon this species is found upon the stem, and not on the foliage, but in the Kew Botanic Gardens says it is on the leaves.

Test of female dull yellow, semi-transparent, with the enclosed reddish-brown female darkening the anterior portion, elongate oval, constricted and tapering to the posterior portion, fringed on margin; dorsal surface very convex with central carina, and slight transverse lines. Length about $\frac{1}{20}$ of an inch.

Adult female reddish yellow, tip of abdomen semi-transparent, with the anal lobes each furnished with a long seta, with spines on the lobes and between them. Anal ring with six hairs; marginal pores well defined.

182. *Asterolecanium miliaris.* Cat. Coccidæ, p. 51.

Asterolecanium petrophilæ, Fuller.

Trans. Ent. Soc., London, p. 456. 1899.

This scale was found upon the foliage of *Petrophila linearis* growing on the banks of the Swan River, West Australia.

The female test is yellowish green, with a white fringe, flat, circular, but sometimes slightly elongated. Length 0·04 inch. This semi-transparent test has a blackish tint from the enclosed female and looks something like the test of an Aleuroyd.

"Adult female with antennæ aborted, mentum monomerous, margin with a single row of figure-of-eight spinnerets and a row of simple pores."

184. *Asterolecanium petrophilæ.* Cat. Coccidæ, p. 52.

Asterolecanium quercicola, Bouché. (Plate XVI, fig. 3.)

Lecanium quercicola, *Stett. Ent. Zeil*, vol. xii, p. 112. 1851.
Asterolecanium quercicola, Signoret, *Anns. Soc. Ent., France* (4), vol. x, p. 279. 1870.
Asterodiaspis quercicola, Signoret, *Anns. Soc. Ent., France* (5) vol. vi, p. 606. 1876.
Asterolecanium quercicola, Maskell, *The Entomologist*, p. 93. 1894.
Planchonia quercicola, Maskell, *Trans. N. Zealand Institute*, vol. xxxviii, p. 390. 1896.

This is the common cosmopolitan oak scale of Europe, which is also recorded from North America, the West Indies and Mauritius. About 1895 it was found in Nelson, New Zealand, upon the oaks, and in the following year Fuller reported it upon many of the oaks in Hyde Park and the Botanic Gardens, Sydney.

The adult females form their circular glassy yellow tests at the extreme tip of the twigs, half buried in the bark, with the upper surface convex, and irregularly rounded. Diameter about $\frac{1}{16}$ of an inch.

When the tips of the oak twigs are badly infested, the three or four terminal leaves turn brown and die, and every twig may be sometimes infested in this manner, but otherwise its presence does not seem to affect the health of the tree.

186. *Asterolecanium quercicola.* Cat. Coccidæ, p. 53.

Asterolecanium styphelicæ, Maskell. (Plate XVI, fig. 4.)

Planchonia styphelicæ, Trans. N. Zealand Institute, vol. xxiv, p. 24. 1891.
Planchonia styphelicæ and *P. fimbriata, Trans. N Zealand Institute*, vol. xxvi, p. 85, 1893, and vol. xxvii, p. 62, 1894.
Fuller, *Trans. Ent. Soc., London*, p. 457. 1899.

This is the common native species with a very wide range over Australia and Tasmania, and though described on *Styphelia richei* and *Leptospermum* bushes, infests many other native shrubs and plants.

The female tests are always found upon the foliage; they are broadly oval, sometimes slightly narrowed behind, convex, and resting upon the surface of the leaf without forming more than a slight depression; general colour greenish yellow, with the darker insect beneath, giving the anterior portion a brownish tint. The outer margin is beautifully fringed with an unbroken band (in fresh specimens) of fine white glassy spines. Length, $\frac{1}{16}$ of an inch.

From the wide range of this species, and the fact that its host plants are all Australian, I do not think that it is identical with the European species, *A. fimbriatum.*

188. *Asterolecanium styphelicæ.* Cat. Coccidæ, p. 53.

Asterolecanium ventruosum, Maskell. (Plate XVII, figs. 1 and 2.)

Planchonia ventruosa, Trans. N. Zealand Institute, vol. xxvii, p. 63, pl. vi, figs. 5-11. 1894.

This species is found upon the twigs of *Acacia liniaris*, growing in the vicinity of Sydney, New South Wales, *Acacia decurrens*, Emerald, Victoria (Mr. C. French, jun.), *Acacia sp.* (Mr. A. Molineaux), South Australia.

The female test is broadly elliptical, flattened, or only slightly convex, more or less impressed into the surface of the bark, formed of a greenish semi-transparent waxy secretion, with the marginal fringe pink or white. Diameter $\frac{1}{20}$ of an inch.

Adult female dark, dull red, sub-circular or only tapering slightly behind; the upper surface flattened or only slightly convex, with the under surface convex and wrinkled. Antennæ and feet absent, but the former indicated by a pair of small tubercules, with the usual figure-of-eight spinnerets. Length, $\frac{1}{20}$ of an inch.

The male test greenish white, glassy, elongated-elliptical, convex.

193. *Asterolecanium ventruosum.* Cat. Coccidæ, p. 54.

Genus XXVIII. *Lecaniodaspis*, Targioni-Tozzetti.

Bull. Soc. Ent. Ital., vol. i, p. 261. 1869.
Prosopophora, Douglas, *Ent. Monthly Magazine*, vol. xxviii, p. 261. 1892.
" Maskell, *Ent. Monthly Magazine*, vol. xxix, p. 105. 1893.

This contains the Australian species which Maskell described under the generic name of *Prosopophora*, and are now included in the above group. Maskell, when defining his species from Australia, somewhat modified Douglas' genus to make them fit into *Prosopophora*.

The members of this genus are closely allied to the *Asterolecanium* in the form and structure of the female tests, but the delicate fringe of glossy filaments is absent round the margins. In the adult female the antennæ, not more than eight-jointed, are well developed; anal tubercules small; anogenital ring with more than eight hairs; legs aborted; mentum monomerous, and in most species a terminal orifice in the enveloping test.

The species is chiefly confined to America and Australia; out of the twenty-three species known ten are described from Australia.

Lecaniodaspis acaciæ, Maskell. (Plate XVII, fig. 3.)

Prosopophora acaciæ, *Trans. N. Zealand Institute*, vol. xxv, p. 225, pl. 14, figs. 1–7 1892.
Prosopophora acaciæ, Fuller, *Trans. Ent. Soc., London*, p. 455. 1899.

The type specimens came from South Australia on the twigs of *Acacia calamifolia*, but it has a very wide range over Australia, and has been found on a number of different species of *Acacia*.

The female test is yellowish brown, waxy, smooth, opaque, slightly convex, irregularly rounded, often with the ventral portion embedded in the bark of the twig; with a small anal orifice at the apex. Length $\frac{1}{7}$ of an inch.

The adult female is of a brown colour and fills the test; the antennæ are short, thick, and apparently composed of four joints, terminal one with a few hairs, feet aborted; anal tubercules bearing two or three spiny hairs; the epidermis with many spinnerets and figure-of-eight orifices.

The male test is white to pale yellow, rugose, waxy, oval, flattened somewhat, impressed with a median ridge and a row of short transverse lines on either side; the apex flattened or truncate with a rounded flap or lid of looser texture than the main portion. Length, $\frac{1}{20}$ of an inch. The female tests are often half buried in the tissue of the bark, aborting the infested twig and forming regular pits all over it.

,, 195. *Lecaniodaspis acaciæ.* Cat. Coccidæ, p. 54.

Lecaniodaspis anomala, Green.

Birchippia anomala, *Anns. and Mag. Nat. History*, vol. vi, p. 541. 1900.
" Green, *Ent. Monthly Magazine*, vol. xxxvii, p. 294. 1901.

This species was made the type of a new genus upon specimens found on an undetermined leguminous plant at Birchip, Victoria. Though Green

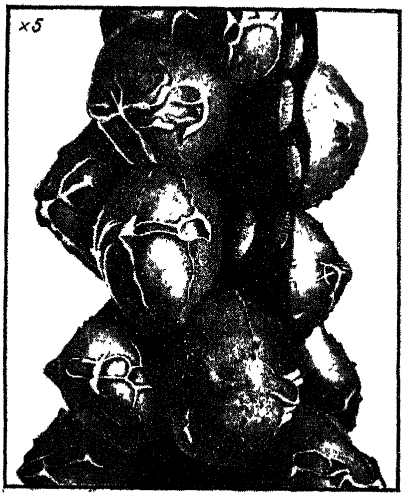

Fig. 1.—*Lecaniodaspis convexus.*

Fig. 2.—*Lecaniodaspis microcribraria*

Fig. 3.—*Lecaniodaspis frenchi*

points out in his " Note on the Genus *Lecaniodaspis* " that this generic name cannot stand, it has generic rank in Mrs. Fernald's catalogue.

The test of the adult female is corneous, semi-transparent, fulvous, formed of brownish waxy secretion, through which the enclosed female can be seen at the anterior portion; broadly oval or oblong, very convex, with numerous transverse and four longitudinal furrows. Length, 1·25.

The adult female is subcircular, joints of antennæ indistinct, usually three, second longest; vertical orifice with many spinnerets; anal ring with ten flattened hairs.

The male tests are white opaque, rather broadly oval, with a circular opening at the posterior extremity.

229. *Birchippia anomala.* Cat. Coccidæ, p. 59.

Lecaniodaspis atherospermæ, Maskell. (Plate XVII, fig. 4.)

Prosopophora atherospermæ, Trans N. Zealand Institute, vol. xxviii, p. 395, pl. xxi, figs. 1–8. 1896.

This coccid is found on the surface of the bark of the branches and trunk of the Sassafras (*Atherosperma moschata*), growing near Fernshaw, Victoria.

The adult female forms thick waxy tests on the bark which are not embedded in pits; convex, longer than broad, having a prominent dorsal ridge with distinct transverse striations. The general colour is a dull reddish brown. Length about $\frac{1}{10}$ of an inch.

The adult female is dull red, fitting close into the test; general form elliptical, dorsal surface convex; antennæ long, composed of eight uniform segments; third longest, terminal one, with hairs; feet wanting, anal segment produced into a pair of tubercules with a bristle; margin of the body with two small depressions containing spines. Epidermis covered with tubular spinnerets springing from figure-of-eight orifices. Anal ring distinct, with about ten stout hairs, surrounded with the anal plates.

The male test is waxy, dark yellow, cylindrical, corrugated transversely, with a flat plate on the anterior portion, through which the male emerges. Length, $\frac{1}{20}$ of an inch.

196. *Lecaniodaspis atherospermæ.* Cat. Coccidæ, p. 54.

Lecaniodaspis convexus, n.sp. (Plate XVIII, fig. 1.)

The female coccids massed together on the branchlets of an undetermined species of eucalyptus growing at Picton, New South Wales. The specimens were determined for me by Mr. E. E. Green.

The test of female is a dull chocolate brown, but the surface is crossed with very fine lines of white secretion in no regular pattern, except that there is usually one forming a dorsal stripe, thin and paper-like but melting in caustic potash, very convex, longer than broad, often slightly depressed behind; the margins tucked well under the body, but the ventral centre open. Length, of an inch.

The male test is a pale dull yellow, elongate oval, the dorsal surface with a fine dorsal carina, but the whole test finely ribbed with transverse ridges; anal portions arcuate. Length $\frac{1}{16}$ of an inch.

Adult female before egg-laying evidently filling the test, much shrivelled afterwards, reddish brown; very convex beneath, with the derm thickened, covered with many fine indistinct figure-of-eight pores; broadly oval, no legs; antennæ eight-jointed tapering to the tip, first three joints uniform, 4th shorter, 5th and 6th longer, 7th short, terminal one irregularly rounded anal segment lobed on either side, with the anal plate almost enclosing the anal ring, which is encircled with a fringe of about twelve long slender hairs.

Lecaniodaspis dilatata, n.sp.

The tests are formed singly on a slender twig of *Acacia discolor*, and the action of the female coccid causes not only a shallow depression to form as in the bark, but the twigs swell out and thicken wherever the coccid locates itself. It is a rare species, but Mr. T. McCarthy (Assistant to Entomologist, Department of Agriculture) collected several specimens on the wattles at National Park, near Sydney, New South Wales.

The adult female forms a slightly convex, flattened, shield-shaped, light brown, granulated, waxy test, longer than broad, the sides irregularly parallel with the extremities rounded; the anal aperture oval, close to the anterior margin, with the test thickened and reddish brown round the opening. Length, $\frac{1}{5}$ of an inch.

The adult female is a dark reddish brown, convex on the dorsal surface, with the hind segment deeply arcuate, showing two tufts in the centre (in potash these melt away). Length, $\frac{1}{8}$ of an inch. In potash, broadly oval with anal cleft moderate, the whole surface covered with scattered slender spinnerets and pores. Antennæ six-jointed, short, thickened, 3rd joint longest, terminal one small irregular, tufted with two long hairs and a number of shorter ones; feet aborted; anal plates broad chitonous, anal ring with apparently ten hairs.

Lecaniodaspis eucalypti, Maskell.

Prosopophora eucalypti, *Trans. N. Zealand Institute*, vol. xxv, p. 226, pl. xiv, figs. 8–11. 1892.
Prosopophora eucalypti, *Ent. Monthly Magazine*, vol. xxix, p. 105. 1893.

The type specimens were found upon the bark of an undetermined species of Eucalyptus at the western township of Whitton, New South Wales.

The adult female forms a felted yellowish-brown waxy test, rather compact, flattened, sub-circular, and resting in a depression on the bark, with a small orifice in the posterior region. Diameter, $\frac{1}{13}$ inch.

The adult female is brownish red, antennæ rather long, composed of six joints, but appear to be eight through converse marks across the third and sixth; feet wanting; anal tubercules small; great numbers of tubular spinnerets and figure-of-eight orifices on the epidermis.

The test of the male is white, grey or yellowish, waxy, smooth on the anterior portion, transversely corrugated on the hind portion. Length, about $\frac{1}{25}$ of an inch.

199. *Lecaniodaspis eucalypti.* Cat. Coccidæ, p. 55.

Lecaniodaspis frenchi, n.sp. (Plate XVIII, fig. 3.)

This remarkable scale comes from the mallee scrub-country in north-west Victoria, where it was obtained by Mr. C. French, jun., covering the branchlets of one of the stunted mallee eucalypts. The specimens were determined by Mr. E. E. Green.

The female tests cover the bark in contact with each other, slightly over $\frac{1}{5}$ of an inch in length, pale yellow or light biscuit brown showing a mottled granulated surface, waxy, convex, irregularly rounded, slightly longer than broad, with the hind portion broadest and the margins turned in underneath, a large oval anal aperture well above the margin.

The adult female is a dark reddish brown, much shrivelled after egg-laying, rounded, concave beneath; anal segment arcuate; antennæ tapering, eight-jointed, 1st to 3rd uniform, 4th to 7th smaller, 8th small and irregular, show aborted fore and mid legs, anal ring and anal plate bright yellow, with a fringe of twelve or more hairs.

Lecaniodaspis melaleucæ, Fuller.

Prosopophora melaleucæ, Journal of the West Australian Dep. Agriculture, p. 1345. 1897.

Prosopophora melaleucæ, Trans. Ent. Soc., London, p. 455. 1899, pl. xv, f. 31.

A species described from specimens found on the branches of a ti-tree (*Melaleuca leucadendron*), Swan River, West Australia.

The adult female is enclosed in an ovate papery test, of a greyish colour, under-surface yellow, having a slight dorsal ridge and several transverse impressions, a decided keel round the margin of the whole test at the junction of the two halves. Length, 0·17 inch. Width, 0·12 inch.

The adult female is a dark brown tinged with yellow; cylindrical antennæ composed of ten joints; feet aborted, anal lobes striated, without spines or setae; anal ring with ten short hairs; a few short spines on margin of body and many figure-of-eight orifices.

201. *Lecaniodaspis melaleucæ.* Cat. Coccidæ, p. 55.

Lecaniodaspis microcribraria, n.sp. (Plate XVIII, fig. 2.)

A scale recorded by Mr. C. French, jun., as very abundant on the branchlets of a small native shrub (*Epacris impressa*), growing on the Dandenong Ranges, Victoria. In a note sent he informs me that in many places on the ranges it is killing out this shrub. This species has been examined and determined under this name by Mr. E. E. Green.

The female test is a greyish brown, broadly oval, very convex, constricted along the margin, with a parallel dorsal ridge, slightly impressed with shallow transverse lines, giving the whole test a roughened surface; anal orifice small and rounded. Length, $\frac{1}{8}$ of an inch.

The adult female is broadly rounded, yellowish brown, with a opaque epidermis that is very finely shagreened with immense numbers of small pores (in one prepared specimen a number of irregularly scattered dark yellow spots stand out); anal plates like the calyx of a flower, with the anal ring at the base with apparently ten flattened hairs pointing upwards; anal segment divided and rounded on either side; antennæ short, composed of eight cylindrical joints tapering to the extremity, second longest, terminal one irregular at tip; feet aborted. Length, $\frac{1}{10}$ of an inch.

Lecaniodaspis newmani, n.sp.

Specimens received from Mr. L. J. Newman, found upon the branches of an undetermined species of *Eucalyptus*, near Perth, West Australia.

The female test is massed together on the bark like those of *Lecaniodaspis frenchi*, which in general appearance they somewhat resemble. Thin, waxy, of a duller yellowish brown without any paler granulations; broadly irregularly rounded, very convex, with the anal extremity produced into a distinct funnel surrounding the small anal orifice. Length, $\frac{1}{7}$ of an inch.

The adult female is dull brown, oval, with stout cylindrical 7-jointed antennæ, 1st to 4th uniform, 5th shorter, 6th short, 7th short irregular, with scattered bristles at tip. Legs wanting, showing only aborted claws representing the fore legs; anal ring granulated with eight long bristles, the chitonous plates well defined on both sides showing stout pines. Epidermis covered with tubular spinnerets. Length, $\frac{1}{10}$ of an inch.

Seed Testing for Farmers.

The Department is prepared to test vegetable and farm crop seeds. Reports will be given stating the germination capabilities of the seed, its purity, and the nature of the impurities, if any.

Communications should be addressed to the Director, Botanic Gardens, Sydney. Not less than 1 ounce of small seeds such as lucerne, or 2 ounces of large seeds like peas, should be sent. Larger quantities are to be preferred. Seeds should be accompanied by any information available as to origin, where purchased, age, &c.

If a purity report only is desired, it should be so stated, to secure a prompt reply. Germination tests take from six to twenty days, according to the seed

Insectivorous Birds of New South Wales.

[Continued from page 602.]

WALTER W. FROGGATT, F.L.S., Government Entomologist.

No. 57. The Delicate Owl (*Strix delicatula*).

OWLS are nocturnal birds of prey that usually sleep or hide during the hours of daylight in thick brush, old ruins, rocky caves, or the hollow spouts of our big gum trees. At twilight and all through the night they hunt for their food, which consists chiefly of small mammals, birds, and the larger insects that move about under cover of the dark hours.

Most of their food is captured on the wing, and their whole structure is admirably adapted for the life they lead. Their plumage is beautifully soft and loose, so that their flight is almost noiseless; their stout legs are furnished with large feet terminating in powerful claws, so that they can snap up their prey as they fly over the ground or through the trees. Their large heads are provided with round projecting eyes, surrounded with a flattened disc of feathers that intensify their vision, and the hawk-like hooked beaks are adapted for tearing their prey to pieces.

In reference to the owl there is some doubt as to which particular bird was defined under this name in the Scriptures, and though the translators from the Hebrew coupled the owl with desolation, more modern students consider that such dissimilar birds as the ostrich, pelican, and cormorant have been placed under the name of the owl.

Among the Greeks and Romans the owl was considered the emblem of wisdom, and was sacred to Minerva, Goddess of Wisdom, Arts and War; and, as Pallas Athene, it was the Tutelary Goddess of Athens.

The Delicate Owl is so closely related to the common European Barn owl (*Strix flammea*) that it is usually considered only a sub-species peculiar to Australia, New Caledonia, New Hebrides, and New Guinea. It well deserves the name of delicate owl on account of its beautiful soft, white breast feathers and dainty brown markings on the back and shoulders.

It ranges over all classes of country. The writer once caught one in the homestead stable among the granite ranges of North-Western Victoria; it was quite blind, and had wasted away to skin and bone from the grass-seeds that had become embedded in its eyes. When on the Flinders River tablelands in Northern Queensland, he remembers them as plentiful, sleeping in the open weather-worn cavities eaten out of the sides of the sandstone gorges intersecting those ranges. Explorers in Central Australia record them as common in the thick-foliaged mulga bushes in the inland scrubs, and others have found them sleeping in the hollow spouts in the limbs of the big gum-trees along the river banks of the Northern Territory.

It is in this latter situation that they usually lay their eggs, six in number, on the decayed wood on the bottom of the cavity in the limb; the eggs are, as with most owls, pure white and very round.

The European variety has the curious habit of bringing up the nestlings in pairs. As soon as the first pair of eggs are hatched, she deposits a second

pair of eggs, which are hatched in due course by the warmth of the bodies of the first clutch, and often a third pair are hatched in this manner. Among the country folk in England the Barn Owl is looked upon as an evil creature that peers through the window of the sick-room, and its sudden hoot at the dead of night warns one of coming death. In some places they also believe that if one discovers a resting owl, he can, by walking slowly round it, cause it to twist its head off, as it keeps turning its head to watch the intruder.

From their nocturnal habits, soft soundless flight, and weird call-notes, the Barn Owls in the dark ages were often associated with witches, who were supposed to assume the garb of owls when flying about at night.

Though to a certain extent a destroyer of insects, it is as an active enemy of mice, rats, and all kinds of small destructive rodents that this owl does so much valuable service to the farmer.

No. 58. The Boobook Owl (*Ninox boobook*).

This bird is also known as the Brown or Cuckoo Owl, and was described in Gould's Handbook under the name of *Athene Boobook.* He says that the native name of this owl was "Buck-buck," in reference to its call-note, but the hoot of the Boobook Owl is "Morepork," sharp and distinct. It is somewhat remarkable that the popular idea was, and still is in many places, that the Frogmouth (*Podargus curveri*), another quaint night bird, was responsible for the weird night-cry of "Morepork," whereas, though this bird is known as the Morepork, it is one of the most silent of birds, and usually, when disturbed, emits nothing more than a harsh hiss or grunt.

This owl is peculiar to Australia, with a very wide range over the country, and is also recorded from Lord Howe Island. Though so noisy at night, when driven out of its resting-place into the bright sunshine, it utters no sound, but, dazed by the unwelcome light, flutters away to more secure cover, at the mercy of all the small birds in the neighbourhood that gather together and hunt it away, looking upon it as a probable enemy.

In the twilight and night-time the Boobook Owl is active and alert, as it silently floats along in search of mice or small roosting birds, which it picks up in its powerful claws as it flies past, and in the same way catches beetles and night flying or feeding insects. Gould states, and other writers have copied his statements, that this owl feeds chiefly upon Orthoptera (tree grasshoppers, phasmids, &c.) and Neuroptera (lace-winged insects), but this is only a minor portion of its food. Its chief value is as a hunter of mice, and when a pair take up their quarters near the farmer's outhouses, they should be carefully encouraged to remain.

The writer examined a large series of cast pellets, voided by a pair of these owls that had selected the hay-shed at Wagga Experiment Farm as their head-quarters, which consisted almost entirely of mouse fur and bones, with here and there a few green feathers that suggested that a green grass parrot had sometimes been caught napping.

The nesting habits are similar to those of the Delicate Owl, but the clutch only comprises three eggs, round and white, resting on the decayed wood in the bottom of the hollow limb.

About one-half natural size.

INSECTIVOROUS BIRDS OF NEW SOUTH WALES.

"DELICATE OWL."

Strix delicatula.

About one-third natural size.

INSECTIVOROUS BIRDS OF NEW SOUTH WALES.

"BOOBOOK OWL."

Ninox boobook.

Poisoning Green Timber with Sodium Arsenite.

C. W. BURROWS, Assistant Inspector of Agriculture.

In this country, where large areas of land are available for occupation, and are heavily timbered, it is of primary importance to remove the timber, either wholly or in part, in order to increase the productivity of the land, and the quickest means is usually the best.

Ordinary ringbarking is effective if done at the right time in that particular district, for it must be conceded that seasons vary considerably from year to year, making the operation an adjustable one. But ordinary ringbarking has one disadvantage—it is slow, often taking twelve to eighteen months before the trees can be burnt off.

Of late years, the action of arsenic has been introduced with marked success in hastening the killing by the ringbarking process, and trees that ordinarily would take months to kill by the old method, are now killed in a few weeks, and frequently in a few days, by the application of arsenic.

Arsenic—the ordinary white arsenious oxide of commerce—costing about 26s. per cwt., is not soluble in water to any great extent, so that soda, either the ordinary washing soda at about 5s. per cwt. or caustic soda at about 28s. per cwt. has to be used in conjunction with it, in order to make it soluble.

Should the ordinary washing soda be used, the proportion should be three of soda to one of arsenic, and boiling is necessary to bring about complete solubility. By using caustic soda, the proportion of which is two of caustic soda to one of arsenic, the mere addition of water in reasonable quantity generates enormous heat, doing away with the necessity of boiling for the dissolving of the arsenic.

When large amounts of the solution are required, washing soda will be the cheaper, but for small quantities of solution, caustic soda will possibly be found the handiest, as boiling is unnecessary.

In dissolving the arsenic, whether for washing or caustic soda solution, there is one point worth remembering: Do not tip the whole of the arsenic into the solution in a dry state, but mix it to a paste slowly and carefully, in the same way as the housewife treats her cornflour, then pour it slowly into the soda solution, stirring it all the time, and be careful to stand on the side away from the fumes, as they are poisonous. When once the soda and arsenic are dissolved and chemically combined the bulk may be made up to the required dilution by the addition of water.

A useful strength for quick and effective work in all kinds of timber is as follows:—

Arsenic, 1 lb.
Washing Soda, 3 lb., or Caustic Soda, 2 lb.
Water, 4 gallons.
Whiting, ½ lb.

The addition of this whiting is merely that it may serve as an indicator on trees treated, as it turns white on slightly drying, making it quite certain what trees have been operated on. An empty kerosene tin makes a useful measure for dissolving in, as it holds 4 gallons.

The time to carry out the work of poisoning is when the tree is dormant—that is, when the sap movement is at its minimum and the sap right down in the roots and lower portions of the trunk. This occurs in the winter months from, say, March to July, according to the district, and must necessarily vary between these limits in a state like New South Wales which embraces such a wide variation of climate. On parts of the North Coast ringbarking has been carried out to the best advantage as late as June and early July in certain years, whereas in the more central parts of the State, late February and March have found the sap movements at their lowest.

The main object in catching the sap to season is to prevent suckering. Trees can be killed by arsenic or ringbarking at practically any time of the year, but to prevent this suckering it is highly important to operate when the sap is down, or just completing its downward course.

Having decided on the season and dissolved the poison, we are ready to "frill" the trees. By "frilling" is meant a succession of downward axe cuts completely round the tree, and each cut well overlapping the adjoining ones so as to leave no unsevered section of bark up which the sap can flow. There is no doubt that "frilling" alone would kill timber if allowed time, but the poison does it in a fraction of the time, in fact trees have been killed in a few days. These cuts must be through the bark and well into the wood proper, and as close down to the ground level as is convenient to cut them consistent with the shape of tree, say from 6 to 10 inches up.

For trees of 4 feet diameter about a quart of solution is poured into this frilling, right round the tree, using an old teapot or kettle, as the spout makes pouring easy and less is wasted by spilling needlessly round about. Smaller trees naturally need less solution.

Saplings may be cut off low down, and with a swab-stick the solution may be dabbed on to kill and prevent suckering.

It is very important that this frilling and the applying of the poison be consistently and thoroughly carried out, and not in any way scamped or slummed, if good results are to be looked for.

There need be no fear about stock being poisoned by eating the fallen or dead leaves from poisoned trees; for when it is considered the comparatively small quantity of solution used, the likelihood of the leaves absorbing any free arsenic is very remote.

Nor is there much danger from stock grazing on areas frilled and poisoned, though it would be desirable to keep all stock off for three or four weeks, when all possible chance of danger would have disappeared.

No estimate of cost can be given as this will necessarily depend upon so many factors which vary with each particular area.

At the time of writing (August, 1915) the prices of materials for cwt. lots are:—

Caustic Soda ...	... ...	28s. per cwt.
Washing Soda	... ...	5s. 6d. ,,
Arsenic (Grey)	... ...	24s. ,,
,, (White)	... ...	26s. ,,

Prices are somewhat inflated at the present time, and of course a slight increase on the figures quoted will have to be paid for smaller quantities.

Athough arsenite of soda is obtainable as such from drug merchants (the price quoted being 42s. per cwt.), its use in that form cannot be recommended for the poisoning of green timber as it is not a definite chemical compound, and its content of arsenic and soda varies in accordance with its methods of manufacture.

White Ants in Fruit Trees.

A Young correspondent recently asked the Department whether a solution of sheep dip would be beneficial in getting rid of the white ants which were attacking his fruit trees and vines. He had tried a solution of a tablespoonful of sheep dip to a pint of water, and after clearing the soil away for a few inches had poured about half a cupful round the trunk. On looking at the trees the following day he noticed that the ants were lying about dead, but he was anxious to know whether the trees would be affected in any way.

In reply the Government Entomologist stated that the Department did not advise the use of sheep dip for this purpose. It was not mentioned which sheep dip was being used, and there were at least a dozen on the market. In some cases 50 per cent. of the contents consisted of arsenic, and in others of carbolic oils, both of which would injure the roots of plants.

The method suggested for checking the pest was to open up the soil and keep it worked round the roots, and to remove all dead wood. If dug in round the roots, phosphatic or potassic manures should drive the ants away.

The Factory Managers' Conference and Butter Exhibition.

M. A. O'CALLAGHAN.

Another successful Butter Exhibition and Conference must be placed to the credit of the Co-operative Butter Factory Managers' Association of New South Wales; and the executive officers should feel pleased with the results of their work.

Taken on the whole, the butter was of good quality, and there were some packages of outstanding excellence for this time of the year.

The Barrengarry Dairy Company (Limited), of Kangaroo Valley, succeeded in obtaining the aggregate prize, and the representative of that factory present at the conference, Mr. Bryen, stated that he attributed his success to the knowledge gained at the Dairy Science School which was held at Albion Park Central Factory by the Dairy Branch officers last winter. A special feature of the Barrengarry butter was its high keeping quality, combined with excellent manufacture. Mr. Bryen informed me that their butter was all made from pasteurised sweet cream which had not been neutralised, and that the starter was made from ferment obtained from the Department of Agriculture.

In the eight-weeks-stored class Barrengarry also won, with a box of butter that ripened out and improved in flavour in cold store. The particulars of this churning are of more than ordinary interest:—

The cream was sweet, was then pasteurised, a starter added, and churned next day, the acidity being put down at 0·3 per cent. When I examined the butter on the first occasion, a couple of days after its manufacture, I had, of course, no knowledge of the maker nor the process of manufacture, but the notes which were made then read as follows:—"This butter tastes as though it had been made from pasteurised cream, but the after taste indicates that the fat has been affected by something which has given it a flavour similar to a slight tallowy result." The butter scored 90 points on going into cold store and 93 points coming out, having improved three points in flavour through the gradual ripening, as a result of a sound starter acting without the presence of injurious micro-organisms. Here the whole history of pasteurisation is combined. No doubt the cream was somewhat acid before pasteurisation, as some of it was about twenty-four hours old. The action of heat in

the presence of this acid affected the fat somewhat, the result being noticed on the first judging. Then came the action of cold and the ripening influence of the starter on a butter made from cream that was churned with a very low acidity.

There is here quite a lot of information for the guidance of those factory managers who contemplate pasteurisation. If it is desired to get a flavour sufficiently developed to place the most suitable butter on the local market in New South Wales, the cream should be ripened until, say, 0·4 per cent. of the lactic acid is developed; whereas, if a butter for export is being manufactured from pasteurised cream, an acidity of 0·3 per cent. is sufficient, provided the starter used is a good one. On the other hand, it is seen that this cream, which had not been subjected to any neutralising process, made a butter which gave the best results. The chemical and bacteriological analyses of this particular exhibit were as follow :—

	Water.	Boric acid.
	per cent.	per cent.
Chemical analysis	12·01	·27
Bacteriological analysis—		
Total colonies	1,274,000 per gram.	
Yeast (white)	3,000 ,,	
B. albus	24,000 ,,	
B. auranticus	24,000 ,,	
S. citreus	17,000 ,,	
Lactic bacteria	1,206,000 ,,	

It is seen that there was a very high count of lactic bacteria, and there were no putrefactive organisms of any moment present. The water content of the butter was what we have always recommended as what should be present in a butter of the highest manufacture. The amount of boric acid present was only half that which is allowed according to the regulations governing export.

Turning to the only other butter which showed an improvement in flavour while in cold store, namely, that of the Alstonville Co-operative Refrigerating Company (Limited), my note on the first judging of this was somewhat similar to that made on the Barrengarry butter; but this sample did not improve so much in flavour as the other. On chatting the matter over with the manager of the factory he informed me that he attributed the cause of the butter not developing a better flavour to the fact that the starter which he employed was rather lacking in activity. The comparatively low count of lactics shown in the analysis indicates that the starter did not make much headway after the cream had been ripened, and the presence of 0·4 per cent. of boric acid would undoubtedly have a materially inhibiting effect on the development of the lactic germs, so that there was not the same opportunity for the butter to develop in flavour as was afforded in the case of the Barrengarry exhibit. Had this butter contained less boric acid, it is quite probable

that the flavour at the end of the term would have been better, as the number of germs opposed to the lactic bacteria was extremely small. The chemical and bacteriological analyses are as under:—

	Water. per cent.	Boric acid. per cent.
Chemical analysis	11·65	·40
Bacteriological analysis—		
Total colonies	261,000 per gram.	
B. viscosus	1,000 "	
S. citreus	3,000 "	
Lactic bacteria	257,000 "	

Only one fishy butter was met with, and there was only one other butter that showed material deterioration in cold store. In this latter case the decomposition gave the butter an extremely "lardy" taste and smell.

Generally speaking, the bacteriological examination of the butters showed that they had been made from cream collected in a cleanly manner, and putrefactive fermentation did not develop to any very material extent. This is a pleasant comparison with previous years' exhibitions, and it goes to show that our factory managers and butter makers have advanced considerably in knowledge of cream grading during recent years. An important point in connection with this is that the exhibit of every factory, as far as my memory goes, which obtained good results in this exhibition, was made, or superintended, by men who have attended the Departmental Dairy Science Schools. Of the seventeen butters exhibited in the eight-weeks-storage class, ten were awarded first-grade points at the end of the period. Though this does not speak too well of the general keeping quality of our butters, still it should be pointed out that only two of the butters were of really low quality.

Coming to the cream grading and butter-judging competitions, it was satisfactory to find that every man who had competed and who had obtained a Departmental cream grading certificate did well in the cream grading competition, and the winner of the double event, Mr Gibson, of the Corndale Branch of the Lismore Co-operative Dairy Company (Limited), proved to be a man who attended two Departmental Dairy Science Schools and obtained his certificate in cream grading. From an educational point of view, it is evident that we are on the up grade, and, given sufficient power to grade cream strictly, our managers will, I think, show that they are equal to raising the standard of New South Wales butter in a way that will enable us to compete, on the British markets, with the butter from any other country competing under similar conditions.

Pure Berkshire Boars and Sows for Sale.

Young Boars and Sows by "Hawkesbury Augustus" (imp.) from selected Sows by "Yarra" and "Manor Captain" are for sale at the Yanco Experiment Farm. Applications should be made to the Manager.

Official Milk and Butter Records.

M. A. O'CALLAGHAN.

HEREWITH are published the result of some Jerseys representing the "Warragaburra" and "Kameruka" herds, both of which are situated in the district of Bega, which has for some time been a stronghold of the Jersey breed. During the past year the Bega district has been favoured with a season better than the average, and hence it has been possible to put up tests representing a cow's capacity without having recourse to much hand-feeding.

The records published show a high average result, though nothing of a sensational character has been demonstrated. The Jersey is holding her own in the testing world; and the dairy-farmers of Australia must, as a result of these tests, be forced to see that we have here animals that, for dairying capacity, represent the breed at its best.

No doubt the high price for beef will adversely affect Jersey cattle for some time to come, as, in the eyes of those who have large farms and are able to raise heifers and steers, the Jersey will not be as attractive as some of the larger breeds. In the very closely settled districts, however, where the farms are small, and where farmers have no means of catering for the butcher by the rearing of steers, no doubt the Jersey will continue a popular favourite.

Mr. A. L. Manning's Jersey Herd, at Warragaburra, Bega.

Period of Test.	Name of Cow and Herd Book No.	Age at beginning of Test.	Date of last Calving.	Total Milk.	Total Butter.	Average of Butter Fat Tests.	Yield on last day of Test.	
							Milk.	Butter.
days		y. m.		lb.	lb.	%	lb.	lb.
273	Tamborine, 1417 ...	6 8	15 July, 1914...	7,677	426	4·9	17·00	1·16
273	Noble Ballet Girl, 2841...	3 6	26 June, 1914...	4,782	267	4·9	11·00	·82
243	Ballerina II, 2819 ...	3 6	7 August, 1914...	4,561	319	6·9	7·00	·68
273	Magnet's Lass II, 1178...	7 0	26 ,, 1914...	6,973	408	5·2	18·50	1·30
273	Rosebud Starbright, 2573	3 11	26 ,, 1914...	6,091	323	4·8	15·00	1·05
273	Cymbal, 2829	3 0	2 Sept., 1914 ..	3,061	207	7·2	4·00	·79
273	Comedy, 2827	3 0	12 ,, 1914...	5,172	316	5·6	10·00	·82
273	Intrigue, 1079	5 10	29 ,, 1914 .	4,237	276	5·9	7·50	·61
273	Majesty's Dido	......	5 October, 1914...	4,881	306	6·0	10·00	·82
273	Solo, 1394	5 1	25 ,, 1914...	5,709	365	5·9	12·50	·99
273	Naiad, 2405	3 11	....	5,239	326	5·8	11·00	·88

Kameruka Estate Jersey Herd, Bega.

Period of Test.	Name of Cow and Herd Book No	Age at beginning of Test.	Date of last Calving.	Total Milk.	Total Butter	Average of Butter Fat Tests.	Yield on last day of Test Milk.	Yield on last day of Test Butter.
days		y. m.		lb.	lb.	%	lb.	lb.
273	Esteem, 2886	8 11	10 October, 1914...	5,605	297	4·6	10·50	·63
273	Jersey Rose, 2902 .	7 3	14 Sept., 1914...	5,136	302	5·4	8·00	·54
273	Linnet, 2903	7 8	18 ,, 1914...	5,230	318	5·5	9·50	·65
273	Maida (imp.), 2904 ...	2 9	8 October, 1914...	5,467	294	4 9	10 00	·60
273	Raincloud, 1342	6 8	14 Sept., 1914..	5,439	344	5·3	8·00	·73
273	Vanilla Custard, 2925 ...	4 11	23 ,, 1914...	6,075	372	5·5	12·50	·84
273	Velvety, 2929	5 0	15 October, 1914..	6,630	403	5·9	9·50	·83
273	Winnie, 2932	11 1	4 Sept., 1914...	5,860	338	5·3	9·50	·70
273	Beryl	6 8	20 ,, 1914..	6,540	346	4·7	12·00	·66
273	Ethel IV	4 0	20 ,, 1914...	5,385	302	5·2	3·00	·24
273	Cowslip, 2880	6 9	11 October, 1914...	5,773	305	5·1	9·50	·65

List of Factory Managers and Testers who obtained Milk and Cream Testing and Grading Certificates prior to 1914.

Milk and Cream Testing.

Name	Address when certificate was obtained.	Name.	Address when certificate was obtained.
C. Lavis ...	Gloucester	M. M. Wade ...	Kempsey
A. E. Hardy ...	Aberdeen	A. Tyson ..	Fernmount
A. E. Searl ...	Morpeth	G. T. Robinson ..	Cathcart
G. Litchfield ...	Kyogle	A. E. Sheehan ...	Mittagong
V. Richardson ...	Toorooka	R. L. Morris ...	Smithtown
A. M. Brown ...	Sydney	W. Connolly ..	Nerrigundah
S. Simmons ...	Wolumla South	Richard Napier...	Central Raleigh
A. Hart ...	Wolumla South	P. Rixen... ...	Bemboka
R. V. Faulkner...	Willoughby	P. B. Johnson ...	West Kempsey
H. McVeigh ...	Bega	A. C. Cox ...	Ballina
J. E. McNaughton	Bega	S. Whitbread ...	Manning River
H. Clark... ...	Cobargo	L. Hammond ...	New Zealand
J. S. Vindin ...	Morpeth	A. Albert ...	Hinton
J. J. Steele ...	Port Macquarie	G. H. Chapman..	Gloucester
M. D. Wall ..	Bemboka	T. E. Wyatt ...	Scone
R. A. Napier ...	Macksville	T. Robinson ...	Wingham
G. S. Stokes ...	Kyogle	H. L. Osborne ...	Paterson
P. J. Johnson ...	Germanton	J. Searl	Singleton
L. Legge... ...	Glen Innes	T. Macaulay ...	Taree
A. McPhillips ...	Fredericktou	W. A. Hooper ...	Singleton

Cream Grading.

C. Lavis	Gloucester	W. R. Higgins ...	Grafton
A. E. Hardy ...	Aberdeen	W. E. Fackender	Leeton
A. E. Searl ...	Morpeth	L. Hammond ...	New Zealand
G. Litchfield ...	Kyogle	A. Albert ...	Hinton
V. Richardson ...	Toorooka	T. E. Wyatt ...	Scone
A. M. Brown ..	Sydney.	H. L. Osborne ...	Paterson

Farmers' Experiment Plots.

POTATO EXPERIMENTS, 1914–15.

Northern Districts.

F. DITZELL, Assistant Inspector of Agriculture.

POTATO experiment plots were conducted in five different districts. The average area cultivated for the purpose was one and one-fifth acres, divided into individual plots of one-tenth of an acre each. The following are the names and addresses of the farmers who co-operated with the Department in the carrying out of these experiments:—

Mr. L. M. Rixon, "Green Hill," Uralla.
Mr. S. Collins, "Rose Valley," Black Mountain.
Mr. Wm. Moore, sen., Guyra.
Mr. T. Farlow, "Mayfield," Red Range.
Mr. J. F. Chick, "Hill View," Tenterfield.

The plots were all uniform, and consisted of eight varieties in the variety trial, all of which were manured with 3 cwt. of P4 mixture per acre. There were also four extra plots of one of the varieties (Queen of the Valley), one unmanured, and the other three manured respectively at the rate of 2 cwt. and 4 cwt. of superphosphate, and 2½ cwt. of P5 mixture per acre. In addition to these a plot of Early Manistee was planted at Uralla, and plots of Wellington, Rector, and Langworthy at Guyra, these all being manured with 3 cwt. of P4 mixture per acre.

A special trial for the prevention of eelworm attack was conducted on the farm of Mr. C. S. S. Ross, "Drumferne," Red Range.

Soil and Cultural Notes.

Uralla.—The soil was a virgin, reddish, friable loam, of medium fertility, with a clay subsoil, and of mixed granite and ironstone derivation. It was cleared in the autumn of 1914, and was disc-ploughed 6 inches deep, in June, subsequently harrowed and disc-ploughed 6 inches deep in August, and again harrowed the first week in October. On the 19th and 20th November the potato sets were ploughed in, 16 to 18 inches apart, and 4 inches deep, in rows 3 feet apart. The after cultivation consisted of harrowing immediately after planting, cultivating about the middle of December, and again at the end of the month, the potatoes being hilled in the last operation.

Black Mountain.—The soil was a reddish loam, of medium fertility, and of ironstone derivation, and had been under crop for twenty-four years. There was no crop in 1913. This land was mould-board ploughed 6 inches deep during the last week in August, 1914, harrowed, and subsequently rolled, and spring-tooth cultivated in September, and again spring-tooth cultivated and harrowed early in November. The potato sets were planted 3½ inches deep,

and 18 inches apart, in rows 3 feet apart, with a machine planter, which worked satisfactorily, on the 23rd November. The ground was harrowed after planting, and again soon after germination, and was later cultivated twice, hilling being carried out at the last operation.

Guyra.—The soil was of a rich, red, friable, basaltic loam, and had been cropped continuously with potatoes for eleven years. Early in August, 1914, this land was mould-board ploughed 7 inches deep, and was afterwards harrowed three times at intervals. The potatoes were ploughed in, 4 inches deep, on the 21st November, in rows 2 feet 3 inches apart, the sets being 20 inches apart in the rows. After planting, the land was harrowed, and later it was cultivated and hilled in the one operation. Any weeds noticed were from time to time pulled out.

Glen Innes.—Here the soil was a friable, brown, basaltic loam, of fairly good fertility, with a good clay subsoil. It was cleared in 1910, cropped with maize in 1911–12, and was not cropped in 1913–14. In July, 1914, this land was disc-ploughed 6 inches deep, and subsequently was lightly ploughed twice, and spring-tooth cultivated twice to destroy weeds. On account of the excessive rains in November, resulting in a weed growth which could not be checked, this ground was not in the best condition at planting time. The potato sets were ploughed in on the 25th and 26th November, in rows 2 feet 8 inches apart, 18 inches apart in the rows, and 5 inches deep. The ground was then harrowed and was later cultivated three times, being hilled at the last operation.

Tenterfield.—The soil here was a friable, greyish, sandy loam, of blue granite formation, fairly deep, with a clay subsoil, and of medium fertility. The previous crop was rape, which was ploughed in as green manure. This land was mould-board ploughed 6 inches deep during the first week in August, 1914, and subsequently was harrowed, then cross-rolled, ploughed and harrowed in the second week in September, harrowed again in September, and spring-tooth cultivated in October. On the 30th November the potatoes were ploughed in 5 inches deep, and 18 inches apart, in rows 2 feet 6 inches apart. The ground was harrowed after germination, then twice cultivated, and finally hilled with the plough.

The Season.

The season was one of the worst for potatoes ever experienced in New England. The total rainfalls at the respective plots between the first ploughing and the planting of the various plots were as follow :—Uralla 869 points, Black Mountain 1,004 points, Guyra 1,031 points, Glen Innes 1,402 points, and Tenterfield 976 points.

The effective rainfalls after planting on each plot were as follow :—Uralla 1,128 points (62 points in March were ineffective), Black Mountain and Guyra 1,168 points each (there was actually no rain in March—a record for these districts), Glen Innes 810 points (42 points in March were ineffective), and Tenterfield 736 points (67 points in February were ineffective).

L. M. Rixon's potato plots at Uralla, showing Premier potatoes, with Manhattan on the left, and Early Manistee on the right.

Potato plots of W. Moore, senior, Guyra

FARMERS' EXPERIMENT PLOTS (POTATO EXPERIMENTS, 1914–15).

An examination of the rainfall for each plot month by month shows that, in comparison with the average for each district, low falls were received in the June and July preceding planting, while there was practically no rain in August, and very low falls in September. The October and November falls, especially at Black Mountain, Guyra, and Glen Innes, were then above the average, and planting operations were delayed considerably. At Black Mountain and at Glen Innes, large growths of weeds had to be contended with, and in the latter case it was not possible to get the ground into the best condition. The plots were all sown during the latter half of November. It is considered that the last week of October and the first two weeks of November constitute the best sowing time. The plots were thus at a disadvantage, especially as the season favoured the early-sown crops.

A good germination of all the varieties, except Satisfaction, Surprise, Wellington, and Langworthy, was obtained in all the plots, and heavy falls of rain in December gave them a good start at all places, except at Glen Innes, where only a poor growth was made. These moist conditions in December were accompanied by warm weather, and resulted in a large amount of Irish Blight in the early crops at Red Range, near Glen Innes. Irish Blight was not prevalent in any of the other districts. The critical months for the crops were January and February, and as these were dry and unusually hot the potato crops right throughout New England were very seriously affected. At Tenterfield the plots were not considered worth digging, and there were very few potatoes produced in the district. The heat was so intense that most of the tubers produced by the early crops rotted in the ground, while the weather conditions were very unfavourable for the late crops. At Glen Innes, Irish Blight destroyed most of the early crops, while most of the late ones failed on account of the harsh conditions experienced in January, February, and March. Guyra produced the best crops in New England last season. The early crops were good, but the late ones were fairly light. At Black Mountain the soils are generally poorer than at Guyra, and the yields were correspondingly lighter. There is not a great area of potatoes grown at Uralla.

The Potato Moth wrought great havoc throughout all the districts. This is always the case in dry seasons, when the cracking of the ground by the growth of the tubers allows the moths to lay their eggs on the tubers.

Variety Trials.

The results obtained are given in Table A. Large numbers of tubers were produced in all the plots, but many did not attain a very large size, and only tubers of marketable size were included in the yields. At Uralla and Black Mountain the plots were dug late, and grubby potatoes of marketable size were included in the yields, for had the plots been dug earlier, not many tubers would have been affected. There was a little Scab in the Black Mountain and Guyra plots.

The highest yield in the plots was obtained at Uralla—Early Manistee returning 8 tons 9 cwt. per acre. This was followed in order by Carman No. 1, Coronation, Manhattan, and Premier.

At Black Mountain, Manhattan was first with 2 tons 10 cwt. per acre, being followed by Queen of the Valley, Coronation, Carman No. 1, and Premier. The low yields from these plots are partly attributable to the soil being only of medium fertility, and having been under cultivation for twenty four years.

The Guyra plots were topped by Queen of the Valley with 5 tons 3 cwt. per acre, and Manhattan, Coronation, Carman No. 1, and Premier were next in order of merit. The rich, red basaltic loams of this district are ideal potato soils.

The Glen Innes plots gave very light returns. The ground was not in the best condition at planting time, and the plots never made a good growth. Manhattan gave the best return with 1 ton 12 cwt. per acre.

The Tenterfield plots failed. Large numbers of tubers were produced as the result of good rains in December, but the very hot, dry weather in January and February prevented them from attaining a marketable size.

Varieties Recommended.

Of the twelve varieties tested in the plots, the following are recommended for general cultivation in New England :—Early Manistee, Manhattan, Carman No. 1, Queen of the Valley, Coronation, Surprise, and Premier ; Satisfaction is recommended for early sowing only. It must be pointed out that in last season's trials Surprise and Satisfaction were at a disadvantage compared with the other varieties, as inferior seed resulted in many misses, especially among the Satisfaction. Brown's River proved unsatisfactory, and will not be further tested. Wellington, Rector, and Langworthy are only new varieties, and, although they did not yield well last season, will be tested again next season. Langworthy and Wellington were at a disadvantage on account of faulty germination.

For notes on the varieties recommended for this district, readers may be referred to the *Agricultural Gazette*, October, 1914, page 834, but, as supplementing those, reference may be made here to two varieties not mentioned there.

Early Manistee matures in about four and a half months, and makes a vigorous, sprawling top growth, with white stems, light foliage colour, and white flowers. The tubers are oblong, light pink to whitish, and have only a few shallow eyes. This variety is well suited for the production of early crops.

Carman No. 1 matures in about four and a half months, and has a vigorous, sprawling top growth, with white stems, light foliage colour, and white flowers. The tubers are oblong, white, and have only a few shallow eyes. This variety also is suitable for the production of early crops.

Manurial Trials.

The best results from the use of manures, as will be seen in Table B, were naturally obtained on the poorer soils, such as at Black Mountain, where the application of 3 cwt. of P4 manure per acre, at a cost of £1 9s. for manure,

gave an increase of 1 ton 5 cwt. per acre over no manure. At Guyra, the soil was a rich, red, basaltic loam, yet manuring proved beneficial, probably because this soil had been cropped with potatoes for eleven years in succession

At digging time the manures appeared to be present in the soil in the form in which they were applied, but the increased yields obtained from manuring indicate that the soluble plant-food had been dissolved out of them. The application of 3 cwt. of P4 manure per acre gave an increased yield of 1 ton 2 cwt. per acre over no manure. At Uralla, the plots were situated on virgin soil, and naturally indefinite results were obtained. The yields from the Glen Innes plots were so low that no reliable conclusions can be drawn.

These results, taken in conjunction with those of previous years, indicate that on the poor and medium soils, such as in the Uralla, Black Mountain, and Tenterfield districts, manuring is profitable. On the richer soils, such as the red loams in the Guyra and Glen Innes districts, manuring does not appear to be so advantageous, unless several successive crops of potatoes have been grown. On new soils also the effects of manuring are not readily apparent.

The P4 mixture appears to be the best for the cooler districts, such as Uralla and Black Mountain, while the P5 mixture gives the best results in the warmer district of Tenterfield, where nitrogen does not appear to be needed so much, probably because nitrification in the soil takes place rapidly during the summer months. Sulphate of potash is contained in both these mixtures, and will probably be unobtainable this season; therefore the application of 2 cwt. of superphosphate per acre is recommended in the Tenterfield district, and for the poor and medium soils of the other cooler districts the best mixture is 2 cwt. of superphosphate with ½ cwt. sulphate of ammonia per acre.

Eelworm Prevention Experiments.

Eelworms are prevalent in certain portions of the Red Range district. The infected tubers are covered more or less with numerous little lumps, some very small, all shallow, and blister-like in appearance. Some paddocks were so badly affected in 1913–4 as not to be worth digging. At the suggestion of Mr. Darnell-Smith, Biologist of the Department, experiments were conducted on the farm of Mr. C. S. S. Ross, "Drumferne," Red Range, with various insecticides. Four plots, each one-twenty-first of an acre in area, were planted with Brownell's Beauty on the 2nd December. One was left untreated as a check plot, the others being treated as follow:—A proprietary preparation, at the rate of 21 gallons per acre, in a 1 per cent. solution; phenol, 42 gallons per acre, in a 1 per cent. solution; and napthaline, 126 lb. per acre, in flake form. The treatments were applied to the bottom of the furrows before the potatoes were dropped. The untreated plot and the one treated with the proprietary preparation germinated quickly, but the other two plots were from two to three weeks slower in germinating.

When the plots were harvested the following approximate percentages of infected tubers were obtained in each plot:—Napthaline, 5 per cent.; the proprietary preparation, phenol, and untreated 20 per cent.

The treatments used were all expensive, and no definite results were obtained, although further tests with small quantities of napthaline would be advisable. The best practical treatment for eelworm-infected paddocks is to destroy the affected plants, and for two or three seasons to grow dissimilar crops, such as oats, and where possible wheat and maize. The application of lime would also probably be beneficial.

General Remarks.

The profitable cultivation of potatoes is dependent upon the maintenance of soil fertility by crop rotation, supplemented by the application of suitable manures on the poor and medium soils. Proper attention should also be paid to cultural methods, seed selection, and the growing of suitable varieties.

In the Black Mountain and Guyra districts the most practicable rotation is the growth of potatoes and oats, while in the districts of Uralla, Glen Innes, and Tenterfield maize and wheat may also be introduced. All weed growths, short stubble, and, where possible, maize stalks, should be ploughed under to provide humus, and on the poorer soils the occasional growth of special green manure crops, preferably legumes, is advisable.

It is very important to precede the crop by a winter fallow to conserve moisture, clear the land, and prepare a good seed-bed. As early in the winter as possible, preferably in June, the land should be ploughed at least 6 inches deep, preferably more, but taking care not to turn up too much raw soil in any one ploughing. Later, the land should be harrowed down, reploughed and harrowed, afterwards being cultivated as necessary before planting. Moderately close planting gives the best results under average conditions in New England, the rows being about 2 feet 6 inches apart, and the sets 16 to 18 inches apart in the rows. The usual depth of planting varies from 4 to 6 inches. Harrowing and cultivation after planting should not be neglected. Hilling is required to protect the tubers from the potato moth. Where the planting has been shallow, the plough is to be preferred for hilling, but where the planting has been deep the cultivator is very suitable. When the moth is very prevalent, as is the case in dry seasons, extra care should be given to the operation of hilling, and a second hilling may be given to fill in the cracks caused by the growth of the tubers. Prompt digging is always desirable in such seasons.

Seed selection is important, and is best done in the field while digging, prolific hills producing good tubers being chosen. Only clean seed, true to type, free from "run-out" potatoes (as indicated by thready shoots and discolouration), and of reasonable size should be sown.

TABLE A.—Showing results of Variety Trials—Northern Districts.

Variety.	L. M. Rixon, Uralla.	S. Collins, Black Mountain	W. Moore, sen., Guyra.	T. Farlow, Red Range.
	t. c. q. lb.	t. c. q. lb.	t. c. q. b.	t. c. q. lb.
Satisfaction	3 10 3 16	0 11 0 15	1 4 2 8	0 11 0 18
Manhattan	6 7 1 25	2 9 3 5	4 15 1 20	1 12 0 16
Carman No. 1	6 18 2 18	1 19 1 1	4 2 0 16	1 9 0 15
Brown's River	4 18 0 24	1 3 3 11	3 0 2 24	0 14 0 7
Queen of the Valley ..	4 17 3 16	2 4 2 17	5 2 2 24	0 16 2 27
Surprise	4 3 2 9	1 5 1 21	1 15 0 0	0 13 1 16
Premier	6 6 0 21	1 18 3 17	3 11 3 12	1 3 3 15
Coronation	6 11 2 19	1 19 2 8	4 9 2 24	1 6 0 26
Early Manistee	8 9 1 12	... .	....	....
Wellington	....	....	0 8 3 7	....
Rector	....	....	1 11 1 20	....
Langworthy	.. ..	....	1 13 3 2	....

TABLE B.—Showing results of Manurial Trials.—Northern Districts.
Variety—Queen of the Valley.

Manure.	L. M. Rixon, Uralla.	S. Collins, Black Mountain	W. Moore, senr., Guyra.	T. Farlow, Red Range.
	t. c. q. lb.	t. c. q. lb.	t. c. q. lb.	t. c. q. lb.
No manure	5 17 3 5	0 19 2 26	4 0 2 8	0 18 1 19
2 cwt. superphosphate per acre	6 9 1 24	1 12 3 16	4 2 0 16	0 12 3 10
4 cwt. superphosphate per acre	6 0 2 22	1 16 0 9	5 0 0 16	0 16 3 24
2½ cwt. P5 mixture per acre ...	5 14 2 7	1 8 1 8	4 17 2 24	0 16 2 27
cwt. P4 mixture per acre ...	4 17 3 16	2 4 2 17	5 2 2 24	0 16 2 27

The manure mixtures used were as follow :—

P4 mixture :— 4 cwt. sulphate of ammonia.
13 cwt. superphosphate.
3 cwt. sulphate of potash.

P5 mixture :—16 cwt. superphosphate.
4 cwt. sulphate of potash.

Southern Districts.

H. C. STENING, Inspector of Agriculture.

POTATO experiments were planted in three different districts in the south, the names and addresses of the experimenters being as follow :—

Mr. A. E. Herring, "Glen Rock," Batlow.
Messrs. H. and R. Heinecke, Tumbarumba.
Mr. A. J. Rial, Wolseley Park.

As throughout the whole of the southern districts, so also in the potato growing portions, the year 1914 and the early part of 1915 will long be memorable as "The Big Drought." Not only was it the driest season on record, but the rainfall during the two previous years was considerably below the average, and in consequence there was no reserve of moisture in the subsoil to supply the deficiency.

As a result of the very unfavourable season, the majority of potato crops failed, and scarcely any farmers who did not supply water artificially to their crop had any potatoes to harvest. Under the circumstances, the returns obtained on the experiment plots at Batlow and Tumbarumba may be considered satisfactory. In these two cases, the land was given a few months' fallow prior to planting, and it is only to the adoption of this practice that the production of the crops can be attributed. The results would have been far more creditable had it not been that the seed supplied was in very bad condition, and in consequence a large proportion of the sets "missed."

At Wolseley Park, the ploughing of the land was deferred in anticipation of rain to soften the hard soil; but, although planting was delayed, sufficient rain did not fall, and it was therefore necessary to plough another area and work it up just prior to planting. As the land was not fallowed; the crops completely failed owing to lack of moisture.

The following tables give the monthly rainfalls during the fallow and the growing periods at Batlow and Tumbarumba:—

TABLE A.—Showing Rainfall during fallow period.

Month.	Batlow.	Tumbarumba.
1914.	Points.	Points.
August ...	34	52
September	97	134
October ...	17	11
November	149	165
December	..	40
Total	267	402

TABLE B.—Showing Rainfall during growing period.

Month.	Batlow.	Tumbarumba.
1914.	Points.	Points.
December	440	522
1915.		
January	120	67
February	72	154
March	130	40
Total	762	783

The rains during the fallow period were very light in character and of very little value; consequently, the only moisture in the soil at the time of planting was that conserved at the time of ploughing. Fortunately, good rains fell in December, shortly after planting, but these were not followed by other rains of much value during the subsequent months—the rains in January, February and March being very scanty and light, and therefore of no service to the crops. No rain at all fell during the period from 22nd February to 29th March.

Cultural Notes.

Batlow.—The soil was a virgin basaltic loam, ploughed in July, 1913, to a depth of 6 inches; disced twice in August; ploughed again on 3rd December, and the sets planted 18 inches apart after every third furrow, making the rows 30 inches apart. After planting, the land was harrowed, and during growth the crops were cultivated between the drills. The potatoes were harvested on 16th June.

Tumbarumba.—The soil was a chocolate basaltic loam, cropped for the first time; ploughed 7 inches deep in July; harrowed in July, and again before planting; ploughed, and sets planted on 10th December—sets being 18 inches apart in drills 30 inches apart. The potatoes were dug on 7th July.

TABLE C.—Showing results of Variety Trials—Southern Districts.

Manured with P4 Mixture at the rate of 3 cwt. per acre.

Variety.	Batlow.				Tumbarumba.			
	t.	c.	q.	lb.	t.	c.	q.	lb.
Premier	3	17	3	22	1	17	0	22
Manhattan	3	7	3	2	2	0	3	11
Carman No 1	3	0	1	2	2	7	3	2
Coronation	3	4	1	4	1	16	3	9
Queen of the Valley	2	2	2	10	2	18	0	4
Surprise	2	4	2	26	1	1	0	14
Satisfaction	...	...	..		1	7	0	13

The yield of Surprise recorded at Batlow is not a fair indication of its yielding capacity, owing to the large number of misses in this plot, but the stands of the other varieties in this district were fairly uniform, and a satisfactory comparison may be made of the results. For comparative purposes, much reliance cannot be placed on the results at Tumbarumba on account of the large percentage of blanks, which were not uniform throughout the different plots; for instance, a better stand of Queen of the Valley resulted than in the case of the other varieties, while the sets of Surprise missed very badly. It would be misleading to judge the yielding capacity of the different varieties on such results.

Taking into account previous years' results, the varieties that can be safely recommended are Coronation, Surprise, Premier, Carman No. 1, and Manhattan.

The yields of Queen of the Valley have not been as satisfactory as the varieties mentioned, nor is it as suitable for culinary purposes. For a number of years Satisfaction has given the lowest yield, and has proved itself unsuitable for the main crop.

A manurial experiment was also planted in each district with Surprise; but owing to the large proportion of misses, the results are in no way comparable, and are therefore withheld from publication.

Southern Tablelands.

R. N MAKIN, Inspector of Agriculture.

VARIETIES suitable for conditions on the highlands were tested on the following farms:—

O. E. Silk, "Woodbine," Nimitabelle.
J. Howard, "Richlands," Taralga.
Boys' Farm Homes, Mittagong.

The plots at Mittagong were sown on 28th October, 1914, and the others shortly after. The ground was in splendid order at time of planting; but unfortunately dry weather set in during December, and what proved to be one of the worst droughts on record followed. In addition to this, the Potato Moth made its appearance in such numbers as to entirely ruin many crops which were making good growth; there was not a district on the southern tablelands that escaped the ravages of this pest. There is no doubt the dry weather conditions were conducive to its spread. When the plots were inspected at the end of January there was no evidence of the pest, but on next inspection at the beginning of March it had a strong hold. In view of these troubles, large crops were not to be expected—in fact, it is a wonder that there were any potatoes at all.

The objects of the experiments were to prove the suitability of certain varieties of potatoes to the district, and at the same time to test the effect of certain artificial manures on the crop.

The Varieties.

There were nine varieties tested, all being sown under the same conditions. P4 mixture was applied at rate of 3 cwt. per acre. In each case the ground had been ploughed some months prior to planting, and the rainfall had been ample, so that a good seed-bed was secured.

Under the trying conditions which prevailed, it will be seen from a glance at the returns that, on the average, Carman No. 1 and Manhattan were the best in point of yield.

Carman No. 1 is a white potato and a good cooker, but does not find favour with many on account of the colour of the skin; it did not appear to resist the grubs as well as other varieties, but it is well worthy of further trial.

Manhattan is a very safe variety to grow, especially on well drained soils; the tubers form up well, there being generally a larger percentage of big ones than in the other varieties, with the exception, perhaps, of Surprise. It was noticed, too, that in this variety there appeared to be something distasteful to the grubs, as it was the most lightly attacked of all the varieties. This was particularly noticeable at Taralga.

Queen of the Valley, which generally does so well at Nimitabelle, was badly attacked by the grub of the potato moth, and this materially reduced the yield; still, it is a safe variety for the highlands, and is a fine cooker.

Satisfaction is well named, as it may generally be depended upon; the tubers are of an even size—inclined to be round than otherwise. It is one of the earliest in maturing.

Surprise was disappointing this time; this was chiefly due to the fact that it will not stand cutting for planting. At Nimitabelle particularly, the loss was excessive on this account, the seed used having been carried over from the season before. This variety is noted for large tubers, and at Nimitabelle it practically reaches perfection, hence it was a difficult matter to secure seed that did not require several cuts. Another feature of this variety is that there are few eyes, consequently it takes about 12 cwt. or over to plant an acre. When it is possible to secure seed of such a size that cutting is not required, much better germination is obtained. This variety was very badly attacked by grubs.

Coronation, as usual, germinated splendidly; the vitality of the sets of this variety is remarkable. It generally stands out as one of the best in this district. One noticeable feature in the returns is that about the same yield was obtained from each of the plots.

Premier germinated well, but it is a very late variety. It was badly affected by the grubs.

Brown's River did not shape well, and may be placed well at the bottom of the list. It is also a late variety. This was the first time it was grown on the plots.

Another new variety was Early Manistee, the returns from which were very satisfactory. The points in its favour are that it is extra early, a fine cooker, and a good yielder of well-shaped, brown-skinned potatoes.

At Nimitabelle, small lots of Rector, Celt, Langworthy, and Wellington were tested under the same conditions as the other varieties. Langworthy (white) and Wellington (blue) may be of some value later on.

Manurial Test.

The manurial test was conducted by setting out plots of Surprise, using the the P4 and P5 mixtures, and superphosphate at the rates of 2 cwt. and 4 cwt. per acre respectively, with an unmanured plot for comparison. The amount of P4 was reduced in this test by 1 cwt. per acre, as compared with previous experiments, the rate being on this occasion 3 cwt. per acre. P5 was reduced to 2½ cwt. from 3 cwt. per acre.

Satisfactory returns could not be expected from this experiment for several reasons—the unsatisfactory germination of the sets, the unusual weather conditions, and the unprecedented attack by grubs being the chief.

However, it is interesting to observe in the table of returns that, whatever effect the manures had, practically the same results were obtained on the coastal plots, viz., the lower quantity of superphosphate gave the better

returns, and the addition of a small quantity of potash to the superphosphate gave still better returns. This is certainly very interesting, for in one case we have the effect produced under very wet conditions, and in the other under opposite conditions. This, however, must be borne in mind: On the highlands the soil was in splendid order at the time of planting, and the weather was satisfactory until January, 1915; the manure had no doubt been of much benefit to the plants in their early growth; in fact, it was reflected in the growth of the tops. This might explain how the manure affected the crops.

TABLE A.—Showing results of Variety Trials—Southern Tablelands.

Variety.	Nimitabelle.				Mittagong.				Taralga.			
	t.	c.	q.	lb.	t.	c.	q.	lb.	t.	c.	q.	lb.
Surprise	2	2	2	0	3	13	2	0	2	0	2	24
Carman No. 1	5	2	2	0	3	7	3	10	3	17	1	0
Manhattan	4	0	0	0	4	15	0	12	3	7	0	20
Satisfaction	4	10	0	0	1	14	2	12	1	4	2	4
Queen of the Valley	3	11	3	0	4	10	1	8	2	9	1	16
Premier	3	7	2	0	4	17	2	8	1	18	2	4
Coronation	3	5	0	0	3	7	0	20	3	0	0	12
Early Manistee	3	8	2	0	....				4	5	1	24
Brown's River	2	15	0	0	2	17	0	24	2	9	0	20

TABLE B.—Showing results of Manurial Trials—Southern Tablelands.

Variety—Surprise.

Manures.	Nimitabelle.				Mittagong.				Taralga.			
	t.	c	q.	lb.	t.	c.	q.	lb.	t.	c.	q.	lb.
P4, 3 cwt.	2	2	2	0	3	13	2	0	2	0	2	24
P5, 2½ cwt.	2	8	0	0	3	11	3	16	2	10	2	24
No manure	1	13	0	0	1	18	3	16	1	4	2	16
Superphosphate, 4 cwt.	2	0	0	0	2	8	0	0	1	12	3	16
Superphosphate, 2 cwt.	1	19	0	0	2	10	3	24	1	19	3	12

MISSING NUMBERS OF THE *Agricultural Gazette*.

THE Lawes Agricultural Trust, which controls the celebrated Rothamsted Experiment Station, of England, is anxious to complete its files of the *Agricultural Gazette* by the time the new laboratory is finished. The only numbers now missing are Volume 10, No. 3, and Volume 22, No. 1; and these cannot be supplied from our own stocks. If any reader happens to have copies of either of the issues referred to, and will forward them to the Editor of the *Gazette*, they will be doing the Trust a valuable service.

Report of Demonstration Area, 1914.

GLEN INNES EXPERIMENT FARM.

R. H. GENNYS, Manager.

THE rainfall for 1914 (January to December) was 32·88 inches, which was one inch above the average for the past five years. The season was mild, the latest frost being experienced in September. The driest months were August (22 points) and September (98 points); the wettest months during the crop-growing season were June (273 points) and October (417 points).

The harvest was fairly wet, 398 points of rain falling in December, 280 of which fell from the 20th to the 31st of that month.

In the following statements, the rates quoted are contract rates obtained from local farmers, and should not be confounded with the local daily rates (actual farm figures), whereby most of the operations are done, and which work out about 25 per cent. less on most operations and increase the farmer's profit to that extent. The profit per acre based upon these figures was £7 11s. 1d.

The higher profit (in the aggregate) from farmers' rates is accounted for by the higher rates at which hay and straw are estimated, as the transfers from one section of the farm to another in some cases are charged at much reduced rates.

Charges for managerial, office expenses, and apprentice labour are purely debits against this farm's figures, not appearing in the farmers' contract figures. The only counteraction is that wheat (first grade) is sold at 6s. per bushel, whereas the farmers' rate is 5s. per bushel.

In the summarised reports of the actual farm figures which are given under the detailed statements in each case, debits are made for all the operations, seeds, &c., enumerated in the above-mentioned statements at the actual cost, or, in the case of seeds grown on the farm, at the valuations given below, also for rent at 8s. per acre (5 per cent. on capital value of land), and wear and tear at 2s. 6d. per acre. The result shows a profit at the rate of £6 17s. 3d. per acre.

Credits are given at the actual cash prices received in the case of sales, and at the following valuations for produce consumed on the farm:—

	s.	d.	
Graded seed wheat	6	0	per bushel.
„ „ oats	5	0	„
„ „ maize	7	6	„
Milling wheat	5	0	„
Feed oats	2	9	„
„ maize	5	0	„
Chick wheat	3	0	„

SUMMARY of Profit and Loss, Demonstration Area, Glen Innes Experiment Farm.

Paddock No.	Area in Acres.	Contract Figures. Total.	Contract Figures. Per Acre.	Actual Farm Figures. Total.	Actual Farm Figures. Per Acre.
		£ s. d.	£ s. d.	£ s. d.	£ s. d.
10	100	588 10 11	5 17 8	469 18 7	4 14 0
11	40	476 19 9	11 18 6	331 11 4	8 5 9
12	32	166 4 9	5 3 10	172 11 6	5 7 10
13	42	424 18 11	10 2 4	512 16 10	12 4 2
15	8	43 8 5	5 8 7	39 1 8	4 17 8
18A	10	52 9 7	5 4 11	65 13 3	6 11 4
	232	£1,752 12 4	7 11 1	1,591 13 2	6 17 3

PADDOCK No. 10.—100 acres. 43 acres Oats and 57 acres Wheat for Grain.

Dr.	£	s.	d.	*Cr.*	£	s.	d.
To Ploughing, at 10s. 6d. per acre	52	10	0	By 1,108½ bus. wheat, at 5s. per bushel	277	2	6
Cultivating, at 2s. 6d. per acre	12	10	0	1,840¾ bus. oats, at 4s. 6d. per bushel	414	3	4
Seed wheat, 73½ bus., at 5s. 6d. per bushel ...	20	4	3	27 tons 17 cwt. 2 qrs. oaten straw, at £4 per ton ...	111	10	0
Seed oats, 72 bus., at 5s. 6d. per bushel ...	19	16	0	35 tons wheaten straw, at £4 per ton	140	0	0
Drilling in, at 1s. 6d. per acre	7	10	0				
Harrowing, at 2s. per acre	10	0	0				
Binder twine, at 2s. 6d. per acre	12	10	0				
Cutting with binder, 5s. 6d. per acre	27	10	0				
Stooking, 3s. per acre ...	15	0	0				
Carting and stacking, 8s. 6d. per acre	42	10	0				
Threshing, 369½ bags wheat at 1s. 4d., 588 bags oats at 1s. 1d. per bag ...	56	9	8				
Grain bags, 80 doz. at 5s. 6d. per dozen...	22	0	0				
Cartage to rail, 63 tons at 1s. per ton per mile ...	15	15	0				
Rent, at 8s. per acre ...	40	0	0				
Balance (net profit) ...	588	10	11				
	£942	15	10		£942	15	10

Profit of £588 10s. 11d., or £5 17s. 8d. per acre.

Actual farm figures—Debits, £157 9s. 3d.; credits, £627 7s. 10d. Credit balance of £469 18s. 7d., or £4 14s. per acre.

PADDOCK No. 11.—40 acres Algerian Oats. 12 acres for Grain and 28 acres for Hay.

Dr.	£	s.	d.	*Cr.*	£	s.	d.
To Ploughing, at 10s. 6d. per acre	21	0	0	By 41 tons 2 cwt. oaten chaff, at £8 5s. per ton ...	339	1	6
Cultivating, at 2s. 6d. per acre	5	0	0	551 bus. 24 lb. oats, at 4s. 6d. per bushel ...	124	2	2
Drilling, at 1s. 6d. per acre	3	0	0	9 tons 13 cwt. 1 qr. oaten straw, at £4 per ton ...	38	13	0
Seed, 65 bus. oats, at 5s. 6d. per bushel	17	17	6	21 tons oaten hay, at £7 per ton...	147	0	0
Superphosphate, 1 cwt. 3 qrs., at 4s. 6d. per cwt.	0	7	10				
Harrowing, at 2s. per acre	4	0	0				
Cutting with binder, at 5s. 6d. per acre	11	0	0				
Binder twine, at rate of 2s. 6d. per acre	5	0	0				
Stooking, at 3s. per acre ...	6	0	0				
Carting and stacking, at 8s. 6d. per acre	17	0	0				
Threshing, at 1s. 1d. per bag	9	19	2				
Grain bags, 15⅛ doz. at 5s. 6d. per dozen ...	4	4	4				
Chaff-cutting, at 7s. 3d. per ton...	14	18	0				
Chaff bags, 94⅝ doz. at 4s. 6d. per dozen ...	21	6	4				
Cartage to rail, at 1s. per ton per mile	15	3	9				
Rent, at 8s. per acre ...	16	0	0				
Balance (net profit) ...	476	19	9				
	£648	16	8		£648	16	8

Profit of £476 19s. 9d., or £11 18s. 6d. per acre.

Actual farm figures—Debits, £52 17s. 11d.; credits, £384 9s. 3d. Balance of £331 11s. 4d., or £8 5s. 9d. per acre.

PADDOCK NO 12.—27½ acres Maize, 3½ acres Potatoes; 1 acre Pumpkins.

Dr.	£	s.	d.	Cr.	£	s.	d.
To Ploughing twice, at 11s. 3d. per acre	18	0	0	By 1,012½ bus. maize, at 4s. 8d. per bushel	236	5	0
Harrowing, at 2s. per acre	3	4	0	6 tons 17 cwt. potatoes, at £5 per ton	34	5	0
Drilling maize, at 1s. 6d. per acre	2	1	3	4 tons 3 cwt. 2 qrs. pumpkins, at £4 per ton ...	16	14	0
Cultivating, at 3s. 3d. per acre	5	4	0				
Seed maize, 6 bus. at 5s. per bushel	1	10	0				
Superphosphate, 18½ cwt. at 4s. 6d. per cwt. ..	4	3	3				
Pulling and husking, at 1s. per bag of 2½ bus. ...	20	5	0				
Shelling, at 3d. per bus. ...	12	13	1				
Corn sacks, 21·1 doz. at 5s. 6d. per dozen... ...	5	15	11				
Carting maize, at 1s. per ton per mile	6	6	7				
Planting pumpkins, at 2s. per acre	0	2	0				
Cultivating pumpkins, at 3s. 3d. per acre	0	3	3				
Pumpkin seed, 6s. 6d. per lb. (actual cost)	0	13	0				
Carting pumpkins, 1s. per ton per mile	1	0	10				
Planting potatoes, at 19s. per acre	3	6	6				
Hilling, at 10s. per acre ...	1	15	0				
Seed potatoes, 2½ tons at £5 per ton	12	10	0				
Digging potatoes, 114 bags at 1s. per bag	5	14	0				
Potato bags, 114 bags at 4s. 3d. per dozen ...	2	0	4				
Carting potatoes, at 1s. per ton per mile	1	14	3				
Rent, at 8s. per acre ...	12	16	0				
Balance (net profit) ...	166	5	9				
	£287	4	0		£287	4	0

Profit of £166 5s. 9d., or £5 3s. 11d. per acre.

Actual farm figures—Debits, £115 10s.; credits, £288 1s. 6d. Balance of £172 11s. 6d., or £5 7s. 10d. per acre.

PADDOCK NO. 13.—42 acres Algerian Oats. 40 acres for Grain and 2 acres for Hay.

Dr.	£	s.	d.	*Cr.*	£	s.	d.
To Ploughing at 10s. 6d. per acre ...	22	1	0	By 1,375½ bushels oats at 4s. 6d. per bushel ...	309	9	9
Cultivating at 2s. 6d. per acre ...	5	5	0	2 tons 8 cwt. oaten hay (2nd quality) at £4 per ton ...	9	12	0
Seed, 68 bushels oats at 5s. 6d. per bushel ...	18	14	0	36 tons 15 cwt. 2 qrs. 3 lbs. straw at £4 per ton ...	147	2	1
Drilling in at 1s. 6d. per acre	3	3	0	Later threshing—			
Binder twine at 2s. 6d. per acre ...	5	5	0	$614\frac{1}{10}$ bushels oats at 4s. 6d. per bushel ...	138	3	5
Cutting with binder at 5s. 6d. per acre ...	11	11	0	17 bushels oats at 4s. per bushel (2nds) ...	3	8	0
Stooking at 3s. per acre ...	6	6	0				
Carting and stacking at 8s. 6d. per acre ...	17	17	0				
Grain bags, 55·7 dozen, at 5s. 6d. per dozen ...	15	6	4				
Threshing at 1s. 1d. per bag	36	4	6				
Cartage to rail at 1s. per ton per mile ...	18	15	0				
Rent at 8s. per acre ...	16	16	0				
Superphosphate, 1 ton 5 cwt., at £4 10s. per ton ...	5	12	6				
Balance (net profit) ...	424	18	11				
	£607	15	3		£607	15	3

Profit of £424 18s. 11d., or £10 2s. 4d. per acre.

Actual farm figures—Debits, £150 7s. 4d.; credits, £663 4s. 2d.; balance of £512 16s. 10d., or £12 4s. 2d. per acre.

PADDOCK NO. 18A.—10 acres Maize.

Dr.	£	s.	d.	*Cr.*	£	s.	d.
To Ploughing twice, 11s. 3d. per acre ...	5	12	6	By 350 bushels maize at 4s. 8d. per bushel ...	81	13	4
Harrowing 2s. per acre ...	1	0	0				
Drilling maize, 1s. 6d. per acre ...	0	15	0				
Cultivating maize, 3s 3d per acre ...	1	12	6				
Seed maize, 2¼ bushels at 5s.	0	11	3				
Superphosphate, 7 cwt. at 4s. 6d. per cwt. ...	1	11	6				
Pulling and husking, 140 bags at 1s. per bag ...	7	0	0				
Shelling, 3d. per bushel ..	4	7	6				
Corn sacks, 9·7 dozen, 5s. 6d. per dozen ...	2	13	6				
Rent at 8s. per acre ...	4	0	0				
Balance (net profit) ...	52	9	7				
	£81	13	4		£81	13	4

Profit of £52 9s. 7d., or £5 4s. 11d. per acre.

Actual farm figures—Debits, £26 4s. 3d.; credits, £91 17s. 6d.; balance of £65 13s. 3d., or £6 11s. 4d. per acre.

PADDOCK No. 15.—8 acres of Wheat for Grain.

Dr.	£	s.	d.	*Cr.*	£	s.	d.
To Ploughing, 10s. 6d. per acre	4	4	0	By 160½ bushels wheat at 5s. per bushel	40	2	6
Harrowing, 2s. per acre ...	0	16	0	8 tons straw at £4 per ton...	32	0	0
Seed wheat, 15 bushels at 5s. 6d. per bushel ...	4	2	6				
Treating seed, 3d. per acre	0	2	0				
Drilling in seed, 1s. 6d. per acre	0	12	0				
Binder twine, 2s. 6d. per acre	1	0	0				
Cutting with binder, 5s. 6d. per acre	2	4	0				
Stooking, 3s. per acre ...	1	4	0				
Carting and Stacking, 8s. 6d. per acre	3	8	0				
Wheat bags, 4½ dozen at 5s. 6d. per dozen ...	1	4	9				
Threshing 53½ bags, 1s. 4d. per bag	3	11	4				
Cartage to rail at 1s. per ton per mile	3	1	6				
Rent at 8s. per acre ...	3	4	0				
Balance (net profit) ...	43	8	5				
	£72	2	6		£72	2	6

Profit of £43 8s. 5d., or £5 8s. 7d. per acre.

Actual farm figures—Debits, £42 18s. 10d.; credits, £82 0s. 6d.; balance of £39 1s. 8d., or £4 17s. 8d. per acre.

Practical Irrigation-farming in Australia.

WITH SPECIAL REFERENCE TO FRUIT AND FODDER CROPS.

A. M. MAKINSON, B.A., Organising Inspector, Agricultural Bureau.

PART III.

Payable Fruit Crops on Irrigation Areas.—What to Plant.

FRUIT-GROWING with irrigation on a large scale was begun in Australia through the enterprise of Californian irrigationists, and the industry has proceeded ever since more or less on Californian lines. A prominent Mildura fruit-grower, who not long ago made a trip through California, said, on his return, that we in Australia had nothing to learn from that country as far as the raisin industry was concerned. This is not surprising in view of the fact that the energies of fruit-growers in our irrigation areas were, for a long time, almost wholly confined to it. But while developing the raisin industry as a result of the lessons learned from the Californians who came over to us, to such an extent that it has at times become rather unwieldy, we have partially or wholly neglected other branches of fruit-growing which have been profitably developed to an enormous extent by Californians at home, though the climate and conditions of our irrigation areas are similar to those of a great part of their fruit country; and it has been proved by individuals that we can successfully and profitably produce many of the fruits which constitute a substantial portion of regular Californian trade. This applies particularly to the navel orange, the prune, the pear, the nectarine, and, perhaps, the walnut.

The chief reason for this neglect has, doubtless, been that most growers, having limited capital at their disposal, have chosen to plant *the vine* from which they could look for an early profitable return; at the same time there is a strong tendency among most men to plant what their next-door neighbours plant, and, with the opening up of large additional areas of irrigable fruit-growing country, it is time for new planters to look further afield. They can hardly do better than to follow the example of California—like the planters of our first irrigation areas—from whose experience so many valuable lessons may be learned; but inasmuch as the new irrigation schemes are far greater in design and potential productiveness, the new settlers must follow that example on different lines, with a wider outlook, and a keener eye to the future.

To avoid Over-production and Develop Markets as Areas Increase.

The experience and example of the irrigation settlements on the Murray go to show that, in our large fruit-growing areas, the time has arrived for settlers to make some provision against planting beyond market requirements and the consequent over-production of particular varieties of fruits, and to seek out and develop new markets to take the produce of new and future plantations. It is useless disguising the fact—fully demonstrated as it has

been by the work of Mildura and Renmark growers—that the Commonwealth market for any variety of fruit is strictly limited, and liable to be over-supplied if that variety is planted recklessly in large acreages;* and while some fruits can be profitably exported others cannot; and, for others again foreign markets have still to be created and developed.

In the past it has happened more than once that when a particular fruit was found to grow well with irrigation, and sell well in the Australian market, it became the fashion; every grower began to plant it and nothing else, with the result that when thousands of acres came into bearing about the same time the local market was swamped and a new and sometimes unprofitable outlet had to be found for the surplus.

The raisin and currant industry, which has hitherto included by far the greater part of the fruit grown under irrigation in Australia, is dependent on the protective duty for its existence; for, in markets outside Australia, lexias and currants sell at prices which barely cover the cost of production, and sultanas for not much more. The growers of these fruits are, therefore, dependent on the Australian market for their profits, though a proportion of the fruit produced is exported or distilled. It is by their co-operation in forming and supporting the Australian Dried Fruits Association, enabling that body to regulate prices and the quantities placed upon the Commonwealth market, that Renmark and Mildura growers have prevented the latter from being glutted, and, sharing among themselves the losses sustained through the low prices obtained for export fruit, have maintained the industry in a profitable state in spite of over-production and other difficulties with which they have had to contend.

Australian Production of Dried Fruits.

The following figures, representing the fruit which has been handled by the Australian Dried Fruits Association from 1907 to 1914, which, with the exception of a small number of currant and apricot crops in South Australia, include practically the whole Australian dried fruits output, are evidence of the co-operative work of growers, and indicate the limitations of the Australian market.

Australian Output of Lexias, Sultanas, Currants, Peaches, and Apricots, 1907-1914.†

	1907.	1908.	1909.	1910.	1911.	1912.	1913.	1914.
		Lexias.						
	tons.	tons.	tons.	tons.	tons.	tons.	tons.	tons.
South Australia	844	743	700	839	965	1,052	1,126	465
Mildura	2,703	1,706	1,506	1,512	1,332	2,124	1,886	2,085
	3,547	2,449	2,260	2,351	2,297	3,176	3,012	2,550
Exported and distilled	2,045	1,450	980	951	884	1,900	1,684	...
Commonwealth sales	1,502	999	1,280	1,400	1,413	1,276	1,328	...

* See figures quoted on p. 573 *Agricultural Gazette*, July, 1915, showing average value of Mildura vine products per acre for eight years (1906-14).

† Published here by courtesy of the Secretary to the A.D.F.A.

AUSTRALIAN Output of Dried Fruits—*continued.*

	1907	1908.	1909.	1910.	1911.	1912.	1913	1914.
		Sultanas.						
	tons.	tons.	tons.	tons.	tons.	tons.	tons	tons.
South Australia	498	378	525	500	659	667	888	882
Mildura	2,204	1,447	1,601	2,563	2,387	3,224	3,355	4,042
	2,702	1,825	2,126	3,063	3,046	3,891	4,243	4,924
Export	810	273	...	...	...	389	494	...
Commonwealth sales	1,892	1,552	2,126	3,063	3,046	3,502	3,749	...
		Currants.						
South Australia	511	248	265	524	1,479	1,740	1,588	1,553
Mildura	445	371	411	1,200	1,095	2,298	2,320	2,547
	956	619	676	1,724	2,574	4,038	3,908	4,100
Commonwealth sales	956	619	676	1,724	2,574	2,829	3,363	...
Exported and distilled	.	...	...	...	...	1,209	545	...
		Peaches.						
South Australia	...	37	38	40	23	71	50	...
Victoria	...	28	28	30	25	52	47	...
	...	65	66	70	48	123	97	...
	All sold in the Commonwealth.							
		Apricots.						
South Australia	...	113	100	182	216	390	127	320
Victoria	..	72	62	208	143	183	45	142
	...	185	162	390	359	573	172	462
Export	...	...	...	..	...	228	. .	..
Commonwealth sales	...	185	162	390	359	345	172	...

COMMONWEALTH PRICES.

	1911.	1912.	1913		1914.	
	per lb.	per lb.		per lb.		per lb.
	s. d.	s. d.		s. d.		s. d.
Currants—						
4-crown	0 $5\frac{7}{8}$	0 6	Less $\frac{1}{4}$d.	0 $5\frac{1}{2}$	Less $\frac{3}{8}$d.	0 $4\frac{7}{8}$
3 ,, ...	0 $5\frac{5}{8}$	0 $5\frac{3}{4}$		0 5		0 $4\frac{1}{8}$
2 ,, ...	0 $5\frac{1}{2}$	0 $5\frac{5}{8}$		0 $4\frac{3}{4}$		0 $3\frac{7}{8}$
Sultanas—						
4-crown .. .	0 $6\frac{1}{2}$	0 $7\frac{1}{4}$	Less $\frac{1}{4}$d.	0 $7\frac{1}{8}$	Less $\frac{1}{4}$d.	0 $6\frac{3}{4}$
3 ,, ...	0 6	0 7		0 $6\frac{3}{4}$		0 $6\frac{1}{8}$
2 ,, ...	0 $5\frac{3}{4}$	0 $6\frac{3}{4}$		0 $6\frac{1}{2}$		0 $5\frac{3}{4}$
Lexias—						
5-crown	0 5	0 5	Less $\frac{1}{4}$d.	0 $5\frac{1}{4}$	Less $\frac{1}{4}$d.	0 $5\frac{1}{4}$
4 ,, ...	0 $4\frac{1}{2}$	0 $4\frac{3}{4}$		0 $4\frac{3}{4}$		0 $4\frac{3}{4}$
2 ,, ...	......	......		0 $4\frac{3}{4}$		0 $4\frac{1}{2}$

Less rebate 5 per cent., discount 3 per cent., commission 5 per cent.
(Prices are for 10-ton parcels.)

The value of co-operation to primary producers has never been more clearly demonstrated, but co-operation in the irrigation areas has as yet only been applied to the *marketing of produce*, and to a smaller extent to the *purchase of goods*. In view of the large additional acreages of fruit under irrigation that will before long come into bearing it is time for growers to take co-operative measures to obtain the most reliable information available as to the market prospects, both in Australia and abroad, of different fruits suitable to their districts, and on the basis of this information evolve some system of *proportional planting.* Growers as a co-operative body already control *the sale of the fruit produced,* but as yet they do not as a body control their individual members as planters, and consequently have no control over *the quantity produced.* A system of proportional planting on a sound basis would enable them as a body to regulate production in accordance with market requirements, and would also be a far better guide to the grower as to what to plant than any he can possibly find while each planter depends on his individual judgment; for, however good a judge a grower may be of what is likely to be profitable, his profits from those fruits to which only restricted markets are open will depend not only on what he himself plants but upon what his neighbours plant also, and as long as this is left to chance, so will be, to that extent, his future income.

Suitable Varieties.

CITRUS.

The Navel Orange.—The Navel Orange under suitable conditions has so far proved the most profitable fruit to grow with irrigation in Australia, and it is likely to remain so. For it the market is ready-made, and it is, perhaps, the only fruit which it may be said that precautions against over-production are not likely to be necessary for many years. The acreage planted with the Washington Navel in California is immense, and navel orange plantations in that country, though recently depreciated in value owing to devastating frosts, have within a few years brought prices up to £400 per acre. The industry must, therefore, be highly profitable in spite of enormous production, and should be even more so in Australia, because Australian-grown navel oranges may be sent to English and European markets in August and September, when, with the exception of limited shipments from South Africa, no others are available; so that in this case the Australian grower is in no sense dependent on the local market.

It cannot, of course, be expected that, as production increases, navels will continue to sell at 18s. per case in London, and 12s. per case in Sydney and Melbourne, but growers owning well cared-for irrigated orangeries on suitable soil will be able to make a handsome profit at much lower prices than these. The cost of exporting to London, including all charges, is about 6s. per case. It is very improbable, even with greatly increased production, that the London price will fall below 12s., or the Australian price below 8s. At these prices, allowing 2s. per case for packing and forwarding to local markets, and reckoning on a crop of 4 cases to the tree, an acre planted with 80 navel

orange trees would yield a profit of over £50. At present prices, navel oranges are a luxury, and there can be no doubt that with larger production and lower prices, the consumption of them would greatly increase. It is true that difficulties have been experienced by exporters of trial shipments in landing this fruit in London in prime condition without a percentage of loss, but these difficulties are sure to be overcome with further experience, as has been the case with other fruits.

Varieties of Navels.—Of the different varieties of the Navel, the Washington—sometimes called the "Riverside Washington Navel"—is undoubtedly the one to be recommended for planting on a commercial scale. "Thompson's Improved," "Golden Nugget" and "Golden Buckeye" Navels and the "Navelencia," are new varieties which have been recently introduced from America, but, though they cannot be said to have been fairly tested as yet with regard to productiveness in an average year—and some of them produce very fine fruit indeed—none of them can be recommended for planting as against the Washington, because they are all very much more susceptible to injury by frost.

The Golden Nugget—a tree of drooping habit with dark glossy leaves—produces a fruit with a very smooth thin skin, excellent in quality and appearance, perhaps superior to the Washington. The Navelencia, for which it is claimed that it is a cross between the Washington and Valencia Late, has none of the late ripening and hanging qualities of the latter, and is not to be recommended. The Golden Buckeye produces good quality fruit, which is, however, rather inferior in appearance, the skin being a light yellow—almost butter colour—and having the distinctive red mark of the Acme, which has evidently had a share in its propagation. The variety known as the Australian Navel bears a very thick-skinned fruit, and is a poor cropper.

Seed Varieties of Orange.—Seed varieties of the Orange bring in small profits in comparison with the Navel, but a few of them should always be included in a plantation of Navels to promote cross-fertilisation, since the pollen of the Navel is infertile. The Mediterranean Sweet, an old favourite, is to be recommended on account of its great fertility, also the Joppa, which produces an orange with few seeds, and of as fine a quality as any among the seed varieties. The Valencia Late and Holdfast will hang on the tree till November, and are for that reason profitable to grow for the local market. The Compuda, an orange somewhat similar to the Joppa, also hangs well; it seems to be little known in this State, but is well liked by South Australian growers. The Seville, the best of the bitter varieties, is not extensively grown, and small consignments usually bring good prices.

The Mandarin.—The mandarin is a fruit of great and increasing popularity in New South Wales and neighbouring States, and those growers who have it in bearing have usually every reason to be satisfied with their profits. Whether this fruit can be profitably exported has yet to be determined, but a small acreage of Mandarin trees will not be out of place in any good citrus plantation. The Emperor is the most popular market variety on account of

its size and appearance, but on the irrigation areas* it is not as good in quality as it looks, as the skin is apt to be puffy and the flesh a little coarse. Dancy, Parker's Special and Thorny are to be preferred for table purposes.

The Lemon.—The lemon is not a fruit from which many growers can boast of having made money. Occasionally it brings very high prices, but more often the price is such that it will barely cover the cost of picking, packing, and marketing. The reason of this is largely because we in Australia have not yet perfected a system of lemon-curing equal to that in vogue in California, and cannot hold the fruit for a market; until we have perfected such a system, and have factories for the disposal of citrus by-products, irrigationists would be unwise to plant more than a few trees.† The Lisbon is the best known and most popular lemon. Eureka or Sweet Rind is also recommended by the Department of Agriculture.

The West Indian Lime is a delicious fruit, superior to the lemon for some purposes, but the tree is extremely sensitive to frost, and on that account cannot be recommended except for planting for home use, and then only if planted in a favourable situation.

Citrus trees should only be planted in rich deep soil. They are more expensive to plant than vines or stone fruits, and take longer to come into bearing, but well selected trees, planted in the right situation, are likely to prove in the end as profitable an investment as any that is open to the fruit grower.

THE VINE.

Suitable Resistant Stocks for Irrigation Areas.—There is only one State (South Australia) in Australia to-day which is free from Phylloxera. It would, therefore, be folly to plant a vineyard (unless permanently isolated) in any of the other States with anything but resistant vines. Before planting resistant vines on a commercial scale it is necessary to ascertain by experiment that the resistant stock is suitable to the scion and to the soil and general conditions. Because a certain stock is suitable for one scion or one locality it does not follow that it will be suitable for another, and a grower who plants out an acreage with resistant vines, the stock of which has not been thoroughly tested, will run a considerable risk.

In response to inquiries by the writer (who cannot claim any personal experience with resistant stocks) the following recommendations have been very kindly supplied:—

Mr. M. Blunno, Viticultural Expert, recommends Riparia x Rupestris No. 3,306 and 3,309 for irrigated lands, especially on light soils, and for limestone soils, Chasselas x Berlandieri No. 41B, and Berlandieri x Riparia No. 157[11], which, when grafted, produce grapes with a high percentage of sugar.

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* The Emperor Mandarin produces very fine quality fruit in the coastal districts of N.S.W., to which it appears to be better suited than to the irrigation areas.

† For particulars as to lemon-curing in California the reader is referred to Mr. W. J. llen's pamphlet on Citrus Culture, where the process is very fully described.

Mr. de Castella (Viticultural Expert to the Victorian Government) makes the following recommendation as to a resistant stock for the Doradillo:—

> "This variety (the Doradillo) seems to have acquired an unenviable reputation as being a bad scion, but I do not think this has been altogether justified. . . . I have seen this variety doing well on du Lot, 3,306 and 3,309. It seems to be a much better scion than the Gordo Blanco. In a general way I prefer 3,306 and A.R.G.1 as stocks for irrigated land. I do not think du Lot a good stock under these conditions (irrigation), its tendency being to promote wood production at the expense of that of fruit."

Mr. W. J. Allen thinks well of the prospects of A.R.G.1 and 3,306 for the irrigation areas. Mr. S. Thompson, manager of Lindeman's vineyard at Corowa, likes 41B in limestone country, but prefers 3,306 where irrigation is practised. The balance of opinion as to the best resistant stock for irrigated country seems to be in favour of Riparia x Rupestris 3,306.

Distillery Varieties.—The Gordo Blanco or White Muscat grape forms the bulk of what goes to the river distilleries.* It has a high sugar-content, but sets badly in any situation that has not a good easterly aspect; it is not to be recommended for planting on resistant stocks, because it is a bad scion. The Doradillo is to be preferred for planting for spirit-making, being a much heavier yielder, though its grapes contain less sugar.

Another vine which has not received the attention it deserves, either for raisin or spirit-making, is the Waltham Cross,† a hardy vine of good sugar-content, a large cropper, and, like the Doradillo, protected from hot winds and damage generally by a thick skin. The Waltham Cross is a vine to be recommended for planting for distilling purposes in the new areas. Mr. Blunno recommends R. x R. 3,306 as a suitable stock for it.

The Profit in Distilling Grapes.—Plantations of the Gordo Blanco, Sultana, and Zante Currant vines have been responsible for the commercial success of Mildura, Renmark, and other Murray River irrigation settlements, but as the Australian market is already over-supplied with raisins, sultanas, and currants, and there is little, if any, profit in exporting them, it is not anticipated that the settlers of the newer areas will plant these varieties to any great extent. Grape-growing for the distilling of spirit is likely to be much more profitable where there is a distillery within easy reach of the vineyard, and the grapes can be conveyed to it direct from the vines. Growers on the Murray some years ago began to sell to distilleries surplus raisins for which there was no profitable outside market. The highest price obtained was £20 a ton, which hardly covered the total cost of producing raisins. A little later local distilleries were erected both in Renmark and Mildura to deal with surplus grapes direct from the vines. This, of course, saved growers the expense of drying surplus fruit (say, £4 per ton), but the highest price

* In 1914 2,563 tons of grapes were treated.

† Sometimes called White Malaga on the Murray.

they got for the fresh grapes was £4 10s. a ton, which (reckoning $3\frac{1}{2}$ tons of grapes = 1 ton of raisins) is equivalent to £15 15s. for raisins, which left the grower little better off.

Investigations have been made by associations of growers, both in Mildura and Renmark, as to the value of the proof spirit which may be extracted from a ton of muscat grapes grown under irrigation, and the cost of distilling the same. The conclusion to be arrived at from the perusal of the results of these investigations, as they have appeared in the press from time to time, is that a ton of muscat grapes, grown under irrigation, will average 155 gallons of juice of 15 degrees Baumé sugar-content, and produce 38 gallons of proof spirit (with spirit at 4s. 9d. per gallon), worth £9 10s. This value has further support from Professor Arthur J. Perkins, who, when Principal of Roseworthy Agricultural College, S.A., made several valuable experiments dealing with this subject. The cost of distilling the grapes varies according to the type of still used and the cost of fuel in the locality, but 1s. per gallon will be a full allowance for it. This leaves the value of a ton of grapes of 15 degrees Baumé sugar-content, grown under irrigation, at £7 10s., which is nearly double the price that growers have been receiving for such grapes from proprietary stills. The wisdom of growers establishing co-operative distilleries i therefore apparent.

THE STONE FRUITS.

Though settlers in the new irrigation areas cannot be recommended to go in for raisin and currant drying, the drying as well as canning of stone fruits (apricots, peaches, nectarines, prunes), and of pears also, may well become an important feature of the new fruit farms. Excepting apricots and peaches, a few hundred tons of which are dried yearly,* the production of these fruits in Australia is very small, though there is a good local market for them, and a very fair English one, especially for apricots, which might be greatly increased and extended by the regular supply of fruit of high quality.

The Apricot.—The Moorpark has until lately been regarded as by far the best apricot for drying, both with regard to quality and the regular bearing of good crops; it is later than many, ripening at Christmas time, and on that account generally escapes spring frosts, from which early varieties are liable to heavy damage. The Moorpark has, however, lately found a rival in a variety called Trevatto, which originated in Mildura, and which Mr. W. J. Allen recommends as a more regular bearer. The Royal also produces a fine fruit that dries out well, but which when dried has more the appearance of a nectarine than an apricot. Particulars concerning the whole-drying of the apricot—a far more profitable process than splitting—will be given in a succeeding article. First quality whole-dried apricots sell remarkably well in London; in fact it has at times paid better to send them there than to sell them on the local market. Growers are not recommended to plant early varieties of the apricot, at all events for drying or canning; they are very liable to damage by frost, and the fruit is generally small and of poor quality.

* For 1914 the A.D.F.A.'s figures are—Apricots, 467 tons; peaches, 167 tons.

The Peach.—There are many fine varieties of peaches to choose from, and for table purposes a grower may pick ripe peaches from November till April if he plants a succession of them, such as Brigg's Red May, High's Early Canada, Ulatis, Louis Grognet, Mountain Rose, Early Crawford, Elberta, and Salway, which ripen in that order. For drying and canning, Early Crawford, Elberta, and Salway will be found as good a selection as there is to be had; they are all heavy croppers, and produce fine large fruit. Clingstone peaches have recently been coming into favour for canning, though not so suitable for drying on account of the extra labour in removing the stone. Two good varieties are Red Shanghai and McDevitt's Cling. Notwithstanding the necessity for splitting them, peaches are, on the whole, an easier crop to deal with than apricots, and are on that account more popular with growers. The demand for dried peaches, however, is not as strong as for dried apricots, and it is doubtful if it is capable of as much increase. The dried peach has to compete with the canned peach, which is equal if not superior to it; whereas the dried apricot, when properly cooked, is decidedly superior to the canned apricot, which has very often been picked in an unripe state, and is inferior on that account. Peach trees are good property, nevertheless, and safe to plant in small areas, especially if a cannery is accessible.

The Nectarine.—At present the Goldmine stands alone as a drying nectarine. It is a heavy cropper, the fruit is large and of good quality, and it has an additional advantage of drying well whole, which cannot be claimed for other varieties. The quantity of nectarines dried up to the present has been quite insignificant, but such lots as have been placed on the market have realised good prices, and there appears to be no reason why the dried nectarine should not become as popular as the dried peach, if produced in sufficient quantities, and pay as well to market at home or abroad. Though few people would grant that it is as fine a fruit, its smooth skin will recommend it to many who object to the furry coat of the dried peach, and will not trouble to remove it when cooked. For table purposes Lee's Seedling, Early Rivers, and New Boy are a good selection.

The Prune.—The production of prunes has been limited hitherto to a very few growers, the reason being, apparently, that the trees take a long time to come into bearing, and that the proper methods of treatment of the fruit before and after drying have not been very widely understood. In California about 100 million lb. of dried prunes are produced yearly, and there is no apparent reason why the production should not be very large in Australia also, for it is really the best-known of all the dried stone fruits, and would probably be the most popular here as elsewhere if available in sufficient quantities. Mr. Vaughan Rae, Secretary to the Australian Dried Fruits Association, is of the opinion that there is a big market waiting for Australian prunes, but it is very doubtful if they could compete with Californian prunes abroad, so the market must at present be regarded as a local one.

Mr. Faulkner of Mildura has been stated in the press* to be "the most successful prune grower at Mildura," getting 7½d. a lb. for his French prunes

* *Murray Pioneer*, 16th May, 1913.

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and 8d. to 9d. for Fellenbergs. It is elsewhere stated that Mr. Faulkner's French prunes in 1913 returned him an average of £1 5s. 2d. per tree, and the Fellenbergs 18s. 3d. per tree. Though it is not certain that these prices would be consistently maintained if large quantities of locally grown fruit came on the market, there should be a good profit in the fruit at 6d. per lb. The varieties favoured by Mr. Faulkner are the French prune (Prune d'Agen) and the Italian prune (Fellenberg), the former bearing the larger crops and the latter the better quality of fruit. Very fine prunes of the Robe de Sargent variety have lately been dried at the Government Experiment Farms in this State.

That the prune has proved a slow grower in Australia is probably due to the use of the Myrobalan (or cherry plum) stock. Wickson says that this stock, which is in general vogue for prunes and plums in California, has been found satisfactory there, though slow-growing; but that quicker returns and larger growth may be obtained on light soils by using a peach or almond stock for certain varieties, and recommends the almond as a stock for the French prune. Our red sandy loams are admirably suited to the almond, so that almond stock for the French prune should be worth trying.

Plums.—Different varieties of plums (as distinguished from the prune or drying plum) are sometimes dried and put on the market, but realise poor prices. A few Japanese plum trees may pay the small grower very well for local marketing. Tragedy, Satsuma, Wickson, and Burbank are standard varieties, approved in California, and Burbank's varieties, Santa Rosa, Rubio and Gaviota are recommended by the Department of Agriculture for the Murrumbidgee areas. There are other new varieties still to be tested. New varieties should never be planted in any number without being tested locally, as there is always a chance of their failing owing to unsuitable local conditions or turning out like the much-advertised Rutland Plumcot, which, in this country at all events, does not seem to bear any fruit at all.

The Pear.—The pear, like the prune, takes eight or nine years to come into profitable bearing, and that can be the only reason why the acreage of pears under irrigation in Australia is so small, for this fruit is very popular either dried or canned, and is very productive under irrigation in our dry climates; it is, next to the Navel orange, probably the most profitable fruit we have when in bearing. As to varieties, "Williams Bon Chretien" (sometimes called Duchess and sometimes Bartlett) is the universal favourite either for drying or canning, and is the one to be recommended. "Glou Morceau" is also a fine variety, and may be planted with the "Williams" with advantage, to promote cross-fertilisation. Packham's Triumph, Josephine de Malines, and Clapp's Favorite are other varieties recommended by the Department of Agriculture. Pear trees grow well on stiff land, and will often thrive on soil not sufficiently well drained for citrus or stone fruits.

The Apple.—Though the apple is a cold-country fruit, there are several varieties which may be grown successfully with irrigation in our dry areas, notably Rome Beauty and Cleopatra; Granny Smith and Trevitt's Seedling are also recommended. But apples are grown extensively without irrigation

in colder districts of larger rainfall, to which they are better suited, at less expense, and for this reason fruit-growers in the irrigation areas are not recommended to plant them for market, though a few trees should certainly be planted to produce fruit for home use and to supply any purely local demand. Yellow Bellflower is an apple that has been very successful throughout California, and should be worth trying, also Red Astracan, a summer variety, which, however, must be stored when green and not allowed to ripen on the tree.

Dried "apple rings" of good quality are in fair demand usually, but do not realise prices that the all-round excellence of this "utility" fruit would seem to warrant.

The Fig.—The dried fig of commerce is the Smyrna fig. In order to grow it successfully, the presence of the *Blastophaga* or fig wasp is necessary to cross-fertilise the pollen with that of the Capri fig. Three varieties of the Capri fig are also necessary, planted at intervals through a Smyrna fig plantation. The growing of figs for drying, however, cannot be said to have got beyond the experimental stage in this country, and it is probable that an increased duty would be necessary to make it pay for the Australian market. There is certainly no payable market outside, for though we in Australia may compete with California on more or less equal terms, we cannot make profits against the cheap labour of the East. The fig wasp was successtully introduced into this country, after several failures, by a well-known fruit-grower at Hectorville, in South Australia. For table purposes Turkey, Black Ischia, and White Adriatic are varieties to be recommended.

The Olive.—Olives have been grown and olive oil manufactured for many years on the Murray, though not on a very large scale on account of the expense of harvesting, which is considerable if adult labour is employed. It has, however, been made to pay, and during the last three years there has been an increasing demand for ripe olives by oil manufacturers, £10 a ton being obtainable for the fruit. At this price they should, like almonds, be a good investment for a man with a large family, as the picking may be easily done by children. As to varieties for oil-making, the writer cannot pretend to make any recommendation; it would be a difficult business for anyone, as there is a vast number of them, and the percentage of oil they contain seems to be in the inverse ratio to their size, Californians, according to Wickson, prefer what is known to them as the Mission olive to any other.

The growing of olives for pickling can hardly be said to have been undertaken seriously as yet by our growers, but it is a business that should be very profitable to a careful, painstaking fruit-farmer if he obtains a suitable variety. The Sevillano (Queen Olive) is the largest and best olive to plant for this purpose, though it is of no use for oil-making. The pickling is a somewhat complicated process, during which the fruit needs a great deal of care and attention, but ready sales, good profits, and an extending market are likely to meet the successful establishment of this little industry. Olives may be pickled green or ripe, but green pickling only is to be recommended for market purposes, because the public have been long accustomed to green

olives, and the pickling of ripe fruit is very much more troublesome and risky. Ripe olives may be easily dry-salted in the French fashion, but they are not likely to sell.

Walnuts.—Much interest should await the results of the experimental planting of several varieties of walnuts imported from California by Mr. W. J. Allen. There is no doubt about there being money in walnuts if they can be successfully grown in our dry areas. Whether they can or not will depend on the finding of suitable varieties and freedom from certain fungus diseases, which have been the cause of serious damage to the walnut in America.

Breakwinds.

In the selection of a "breakwind," a fast-growing tree with thickly-spreading foliage is to be desired, and one that will not unduly rob the trees or vines which it is planted to protect. Many trees which would afford excellent shelter are great robbers, and should not be planted on that account. For instance, no better protection could be had against wind than a row of well-grown pepper trees, but no fruit tree within fifty yards of them would do any good; the almond, too, has often been planted for a breakwind, having the advantage of producing something that will sell as well as affording shelter, but it also is a great robber. The tamarisk will be found about as good a breakwind as may be had, as it grows quickly and thickly and does not rob its neighbours; or, if it is desired to plant one that will bring in a profit of its own, the olive will serve very well, or the walnut, quince or fig.

A Selection of Fruit Trees for 20 Acres.

As the markets stand at present, the following areas may be recommended to a grower about to plant 20 acres with fruit, provided his soil and its situation is suitable for the varieties named:—

Navel oranges	5 acres.
Mandarins	½ ,,
Seville and Sweet Seed oranges	½ ,,
Pears	3 ,,
Apricots	3 ,,
Prunes	2 ,,
Nectarines	2 ,,
Peaches	1 ,,
Vines for distillery purposes (on suitable resistant stocks)*	3 ,,
Total	20 acres.

* Provided there is a local distillery.

A property thus or similarly planted with a varied assortment of fruits in small acreages will require a wider knowledge of fruit culture from the grower than a plantation of only one or two varieties, but in such a property both seasonal and market risks will be minimised, and the grower will be able to give more personal attention to his trees and do with less hired labour.

(To be continued.)

Poultry Notes.

JAMES HADLINGTON, Poultry Expert.

September.

If poultry-farmers have profited by past experiences, both their own and those of others, very few eggs will be set after the middle of this month, which means that very few chickens will be hatched after the first week in October, thus bringing the present hatching season to a close.

The temptation to continue hatching through October is well understood, because as a rule hatchings are good at this time, but in most cases stock so hatched cannot be considered profitable. I am quite certain that the total elimination of the late chicken would result in a very great improvement in our flocks, and in more profitable operations generally. While I do not advocate hatching in the late summer and autumn as a means of producing layers, and prefer to regard such as more of the nature of a "catch crop" and principally for table poultry purposes, it is certainly preferable to hatching in October, November, and December. The period from the first week in October to the end of December may be considered the most unprofitable time to have chickens hatched; this phase of the matter is more fully dealt with in "Seasonable Hints for Poultry-keepers" now issued as Farmers' Bulletin No. 98.

A Seasonal Trouble.

In last month's notes reference was made to brooding chickens with hens. Where this method is adopted a sharp look-out should now be kept for a species of tick known as the "sucking louse," which is often found infesting the heads of chickens that are being brooded with hens, and sometimes even brooder chickens become infested in cases where they come in contact with the hens. The first sign of infestation usually noticed with this sucking louse is that the chickens droop their wings and look peeky and ill, without any apparent cause; when such are noticed it is as well to examine the chickens closely about the top of the head and under the throat for these vermin; they are not easily detected unless looked closely for. If the infestation is in the early stages, probably a mass of nits will be seen, while the more mature specimens will be found to have their heads partially buried in the skin of the chickens about the parts mentioned. If there is any doubt, a piece of flannel moistened with kerosene and held on the head of a chicken for a second or two will cause the lice to withdraw and show themselves. If one chicken is found infested it is safe to assume that every chicken in that batch has been more or less attacked, in which case no time should be lost in treating the whole of them. The destruction of this louse is very simple, and consists in very lightly touching the top of the head and under the throat with salad oil. This should be done as lightly as possible, preferably with a piece of flannel or a small brush slightly moistened with the salad oil. This is all that is necessary to kill the insect, while stronger applications such as

kerosene and the greasy and caustic substances sometimes used, will cause injury if not death to a large number of the chickens. The treatment is best done in the daytime, and preferably on a warm day, because if done at night or when the chickens are being brooded the hens will be smeared with the oil and consequently all the chickens will be soiled. The treatment should be repeated again in eight or ten days' time. It should be clearly understood that this is not the "Fowl Tick" (*Argas persicus*) as is sometimes supposed, but a species of tick only seriously affecting very young chickens, perhaps up to ten weeks old. The common fowl tick is quite another pest with altogether different habits.

Too Much Green Feed.

Under present conditions there is a strong temptation to give too much green feed to poultry. Recently many instances have come under my notice where, apparently owing to the advocacy of the use of green feed in the morning mash on grounds of both health and economy, it would appear that the scarcity and high price of foods combined have induced many poultry-keepers to overdo the green feed idea, and have suffered in consequence. I have pointed out from time to time that a third of the morning mash for poultry may consist of a good class of chaffed succulent green feed such as lucerne, green barley, &c.

In the cases mentioned, however, one-half, and even up to two-thirds of the morning mash has consisted of green feed, much of it of very inferior quality. Even weeds have been fed in this way. I found, too, that in some cases only a light feed of grain was being fed at night; consequently the birds being hungry the next morning, were forced to eat an amount of green feed that would otherwise be rejected to obtain the small amount of pollard and bran that was in the mixture. Crop troubles and poor laying were the inevitable results in most cases.

It might be pointed out that green-stuff taken in such large quantities, especially if of poor quality, and eaten at the one time as in the cases mentioned, is very difficult for poultry to digest.

Nature has not equipped poultry with the capacity for dealing with green feed in sufficient quantity to sustain life and to produce large numbers of such a concentrated product as an egg. The food most closely allied to the natural requirements of poultry is concentrated, such for instance as grain and its products, insects, &c.; green feed should be used merely as an adjunct, which is to be taken in small amounts, and not in bulky quantities. A glance at the relative composition of the usual poultry foods, and the most valuable green feed, viz., lucerne, will best illustrate this point:—

	Water.	Ash.	Fibre.	Protein.	Carbo-hydrates.	Fat.
	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.
Pollard	12·1	3·3	4·6	15·6	60·4	4·0
Bran	12·3	5·9	8·1	16·0	53·7	4·0
Wheat	10·5	1·8	1·8	11·9	71·9	2·1
Lucerne	71·8	2·7	7·4	4·5	12·5	1·0

Taking the protein, carbohydrates, and fat as the main feed considerations, it will be seen that nearly four times as much lucerne as of pollard and bran would have to be eaten to supply the same amount of nutrients. To put the matter in simpler terms, it is well understood that a laying hen will fill her crop at the morning feed with pollard and bran mash, and still constantly peck at green feed during the day. It is clear then that when she fills her crop with a mixture largely made up of green-stuff, she fails to extract sufficient nourishment to maintain her in full laying condition, and in fact may be practically starving owing to the somewhat indigestible character of such a food when taken in large quantities.

If this view is sound when lucerne is taken as an example, what can be expected from the feeding of weeds and other green stuff of poor quality?

Egg Production.

During the present month and also October the maximum egg production of the year will be reached; and any hen that is worth keeping should be laying from four to six eggs per week, and those not coming up to that standard might reasonably be considered poor layers. In the absence of any other method of selection these might be marked for early disposal when the declining egg production sets in, which it usually does about the end of November.

FARMERS' BULLETIN, NO. 101, "WHEAT CULTURE."

"HARDLY any feature of agriculture in New South Wales is more interesting or more surprising than the development of wheat growing that has taken place in the last twenty-five years. In 1891 the area devoted to this cereal was only one-third of a million acres; to-day it is ten times as large. In 1891 wheat occupied less than 40 per cent. of all our cultivated lands; to-day it represents over 81·8 per cent." Thus does the Chief Inspector of Agriculture in the latest of the Department's bulletins introduce his subject to the farmers of the State. The comparative ease with which wheat can be grown in New South Wales and the certainty of a market, usually at a fairly profitable figure, have been important factors in the development of the industry, but as this bulletin reminds us, two other factors of much significance have also operated: first, the production of improved varieties; and, second, the evolution (for such it has largely been) of better cultural methods.

Needless to say it is the chief purpose of this bulletin to so present these two important aspects of wheat production—the value of the best methods and the best varieties—as to induce growers to employ them, and them only.

No indication can be given here of the range of this little work of 125 pages. Suffice it to say that, with the exception of diseases and pests, which are reserved for another bulletin, there is hardly any subject associated with the practical cultivation of wheat in this State that does not receive adequate notice in some degree. The bulletin can be obtained free on application to the Under-Secretary and Director, Department of Agriculture, Sydney.

Agricultural Bureau of New South Wales.

NOTES COMPILED BY H. ROSS, Chief Inspector.

Notice to Honorary Secretaries.

It is important that regular monthly meetings should be held, and that a record of the meetings of the branches should be inserted in the *Agricultural Gazette.* Honorary secretaries are invited to forward to the Department a short account of the proceedings of each meeting, with a brief summary of any paper which may have been read, and the discussion that followed it, as early as possible after each meeting. Notes for insertion in the *Agricultural Gazette* must reach the Department before the 14th to ensure insertion in the following month's issue.

Insect Pests.—Quite a number of the branches have availed themselves of the Department's offer to supply a set of the common insect pests of the district, and collections are cased as required. The Government Entomologist suggests that as each district has certain pests peculiar to its orchards and gardens, more useful work would be done if the members themselves collected the local pests (orchard, garden, and stock) and sent them to the Department, where they would be arranged, mounted, a descriptive label attached, and returned to the branch. Mr. Froggatt considers that such a collection would have a far greater value, as there would be more interest attached to the specimens when the members knew exactly where the pests came from, and where and how to find them.

Sheaves of Grasses.—The Department is prepared to supply to branches of the Bureau which make application through their secretaries, collections of sheaves of grasses considered suitable for the respective local conditions.

Organisation of Branches.

An officer (Mr. A. M. Makinson) has been appointed especially to attend to the needs of branches of the Agricultural Bureau, and generally to organise this movement.

He will visit in turn every branch throughout the State, and confer with the secretaries and members as to future operations, &c.

Secretaries will be advised in due course when this officer will pay a visit to their respective districts.

Demonstrations in Clearing Land and Subsoiling with Explosives

A limited number of demonstrations in clearing land and subsoiling with explosives will be given by Mr. C. W. Burrows, Assistant Inspector of Agriculture, to branches of the Agricultural Bureau. Branches who wish to take advantage of this offer are requested to make early application to the Department through their honorary secretaries.

Bee-keeping.

A series of lectures on bee-keeping is being arranged by Mr. R. G. Warry, Instructor in Apiculture. Secretaries, whose branches intend availing themselves of this opportunity to receive a practical insight into this branch of agriculture, are requested to make early application.

Lessons of the Drought.

A suggestion, which is worthy of consideration, has been made by the Secretary of the Wolseley Park branch, to the effect that branches of the Bureau throughout the State should set apart a meeting for the reading and discussion of papers by members on "Lessons of the Recent Drought."

It is thought that discussion on the subject will be of permanent benefit to those farmers who may have bitter experiences to relate.

Branch secretaries might well introduce this matter to members, and invite them to prepare papers.

The Department will be glad to receive copies of such papers and reports on the discussions.

REPORTS AND NOTICES FROM BRANCHES.

NOTE.—While gladly publishing in these columns the views of members of the various Branches of the Agricultural Bureau, it is pointed out that the Department does not necessarily endorse all the opinions expressed.

Albury.

The following is a report of a lecture delivered by Mr. M. Blunno to, members of the above branch on 30th June :—

GRAFTING AND BUDDING OF THE VINE.

Vines may be grafted at almost any age, but phylloxera-resistant stocks should be grafted when one or two years old. After this the older the stock the less the chance of success. All suckers growing on stocks that are intended for grafting on should be carefully removed when green, as it is essential that the stem of the vine be clean, smooth, and straight.

Avoid diseased canes and canes that have not borne fruit. Select canes with narrow pith, well summered. These are more easily found on older than on young vines. Prune the canes off the vine before the sap rises, and keep them in a cold place. Canes may be made into cuttings of about 20 inches, tied in bundles, and the bundles set upright in line, and covered in sand—top, bottom and sides. By keeping the cuttings in sand in this way in an underground cellar, or in any "dug-out" away from the sun or drying winds, they will remain dormant for a long time after the sap rises in the stocks that are to be grafted. Cuttings may be kept also in the shady side of a shed, heeled in, and covered over. The essential is that the scion be dormant when the sap rises in the stock.

To judge the vitality of canes take two or three of them from a bundle, put them in a bucket half full of water, and keep them in the sun or at a gentle heat in a room. If the buds swell, or if small drops of water show on a nick made with a knife on a joint, the canes have lost none of their vitality. Some people go by the appearance of the bark tissues of a fresh cut, but this manner of judging of the vitality of a cane is sometimes misleading.

The quick knitting of a graft depends on the temperature of the soil. If the soil is warm the knitting tissues form quickly, but if the soil is cold, the formation of those tissues is delayed, with the possibility that the vitality of the surface tissues of the cuts on both stock and scion will be impaired whether the conditions be cold and damp or cold and dry. If the graft is done in spring it is safe to expect a gentle warmth that will cause the quick growth of the knitting tissues. Grafting can also be done in autumn, but only in districts where autumn weather is genial; the knitting tissues then form before wintry weather sets in.

It is an old practice to graft a little below the surface of the soil. There is no objection to this when grafting a European vine on a European vine, but the graft should be above ground when on resistant stock. Half an inch above the level of the soil is more than sufficient to prevent the growth of top roots. Roots growing on a scion are apt to take a large development, because the nearer the surface the warmer the soil. This large development of top roots takes place to the detriment of the roots of the resistant stock, which remain undeveloped, and phylloxera will eventually kill the top roots and the vine will collapse.

The most common method of grafting is the split graft, known also as the wedge graft. This system is suitable for grafting young and old vines. The whip and tongue graft

is suitable when the stock is young, and of the same thickness as the scion. There are quite a number of more or less fancy grafts which, however, are not in general vogue, and the success of which much depends on favourable local conditions.

Raffia fibre is used for tying up the graft. It is elastic and does not strangle the stem. To prevent it from rotting too quickly, which may occur when the season happens to be wet, it is a good idea to dip it in a solution of 3 or 4 oz. of bluestone in a gallon of water. Strips of calico can also be used for tying up. After tying up, the graft is protected by applying some clay. A good mixture for the purpose is made with two parts of clay and one of horse-dung, to which is added a handful of salt to keep the mixture moist. Suitable grafting wax is prepared with the following ingredients:—1 lb. yellow wax, ½ lb. Burgundy pitch, 3½ oz. tallow. Melt these on a gentle fire, then remove the pot and slowly add 1 lb. of turpentine, stirring and mixing the whole. This mixture will keep soft even in very cold weather.

Some people do not earth up sufficiently. A good mound of fine soil should be drawn up round and over the graft. The top of the scion should always be protected by 1 inch of soil, especially where drying winds blow strongly and frequently. By the side of the grafted vine should be driven a small stake to which the shoots from the scion should be tied. All shoots (suckers) from the stock should be carefully removed as soon as they show themselves. It is a bad practice to pull them off, because by doing so the bark tissues are lacerated, and this encourages the growth of more suckers. The best way is to cut them off with a knife close to the stem. Towards the end of the season the earth mound is gradually flattened down.

The vine may be budded in autumn and late in spring. A bud with its shield is inserted on the stem of the stock close to the ground. The operation should be performed at the fall, because it is essentially an autumn graft. It is known in Australia by the name of "Yema graft"—"Yema" is the Spanish word for bud. The method has proved a success in Victoria.

Spring budding has often been attempted, a bud with its shield being inserted under the bark of a green shoot as is done for fruit-trees, but the number of failures has always been larger than the number of successes. A vigneron in the south of Italy evolved a new system, by which the bud carries a whole section of the bark instead of the small shield. On a suitable shoot of a phylloxera-resistant vine, a bud with portion of the bark is removed so as to leave the wood denuded. The bud carrying a section of bark taken from the European vine is applied to this wood, so as to make the bud fit on the spot where the other bud was. It is tied round, and about five weeks later the raffia is loosened. The system was successfully introduced, and is carried out at the Viticultural Station, Howlong. The table-grape growers in the County of Cumberland find it suitable and useful, especially if the usual early spring graft fails; then one or two shoots are allowed to grow from the stock and these are budded when they are strong enough, which is some time in November. The suitable time in this district is from the middle of November to the middle of January—in other words, while the shoots are still sappy and the bark peels off easily.

Bimbaya.

A meeting of this branch was held on 28th July, when a paper was read by Mr. E. H. Filmer, making a comparison between Hickory King and Boone County Special maize:—

Varieties of Maize.

Mr. Filmer stated that in September of last year he procured seed of both varieties. A plot of 5 acres was ploughed and harrowed, then drilled with the plough and sown with the maize-drill late in September and again harrowed. The Boone County Special maize was sown in this paddock, which was very badly infested with couch grass. It was scuffled twice and the hoe was also used to some extent.

The maize ripened in March and was harvested early in April. Seventy-one laced Chapman sacks of maize were pulled from this paddock.

At the time of ploughing the ground was very wet and boggy, and in some places couch grass was very thick. The maize was sown on the thin side, owing to the grain sometimes sticking in the plate-holes in the drill. In places the stalks were 2 yards apart. The crop came up very sickly-looking at first, but after a few weeks grew rapidly, and by Christmas was 12 feet high in places.

There was only a small percentage of barren stalks, most of them having two or three cobs to the stalk, and, in some instances, four. About a quarter of a bushel was sown on the 5 acres.

In August and September about 14 acres were ploughed and harrowed, and in late September and October this was cross-ploughed and harrowed, and then drilled with the plough and sown with the maize-drill with Hickory King maize. This paddock was in nice order at the time of planting, but was somewhat neglected for a time through pressure of other work. It was twice scuffled. Later in the season about 4 acres were hand-fed to cattle, and all barren stalks were cut from the remaining 10 acres. The maize ripened and was harvested in May. The yield was seventy-five laced Chapman sacks. There was a large percentage of barren stalks, and few stalks had more than one cob.

Mr. Filmer believed that had he sown all Boone County Special maize he would have had 100 bushels more grain. On selecting two average cobs and weighing them, it was found that while the piths were of equal weight, the cob of Boone County Special contained 23 per cent. more grain by weight than the Hickory King.

It was decided that the rearing of calves be discussed at next meeting.

Blacktown.

The monthly meeting was held on 3rd August, Mr. G. A. Lalor (Vice-Chairman) presiding.

The Secretary reported having completed arrangements with the Water Conservation and Irrigation Commission for an officer to deliver lantern lectures on the Murrumbidgee Irrigation Areas on 25th September and 23rd October. It was decided to invite members of local bodies and associations in surrounding districts to be present at the lecture on 25th September.

Bloom Hill (O'Connell).

A meeting of the above branch was held at O'Connell on 17th July. There was a fair attendance.

A demonstration of winter pruning was conducted by Mr. Meier, Orchardist of Bathurst Experiment Farm, at Mr. S. Morgan's orchard, Alick Swamp, near O'Connell, on 21st July. There was a good attendance, including pupils from Bloom Hill Public School. In addition to pruning various fruit-trees, Mr. Meier also gave a demonstration of budding and grafting, and supplied useful information on spraying for insect and fungus pests. Those present expressed their appreciation of the benefits derived from the demonstration.

Borambil.

A meeting of the Borambil branch was held on 1st July, when there was a good attendance.

Mr. A. M. Makinson, Organising Inspector of the Agricultural Bureau, was present, and gave an address on the object of the Bureau, which, he said, was to enable the farmers to make more out of his land. For that purpose the Department had a large staff of trained experts for every branch of agriculture. He urged farmers to be active members and not to leave all the work of organisation to the secretary. Every member should make an effort to secure one new member each year. Every branch should have a library at its place of meeting, as a nucleus of which the Department supplied bulletins and the *Agricultural Gazette* free. It would be a good idea for branches to spend a part of their surplus funds in purchasing standard works on the various branches of agriculture.

Coobang.

The Chairman (Mr. W. T. Annison) presided at the monthly meeting of this branch, held at Mr. B. Seidel's residence on 29th July.

A programme of papers to be read by various members, extending to the December meeting, has been arranged, and good results are anticipated from the efforts of the members.

At the meeting referred to the Chairman (Mr. W. T. Annison) contributed the following paper:—

ENSILAGE MAKING.

In dealing with the question of making ensilage, I do so in the hope that it will form one of a series of papers on the conservation of fodder. After the disastrous losses of the past twelve months, it is needless to emphasise the importance of making provision for a time of scarcity.

Realising that this is essentially a wheat and sheep district, I shall endeavour to deal with the subject from a wheat-grower's point of view, and will not attempt to quote figures relative to the feeding value of ensilage more than to say that it has been proved to be excellent feed for sheep (especially lambing ewes), cattle, and spare horses, but working horses need more concentrated foods. All stock will eat it once they have acquired the taste, and I have known horses to leave prime wheaten chaff and oats to get silage that was being fed to cows at the same time.

The first question is the material to be utilised, and maize silage has the greatest feeding value, but any green crop can be used. What is most likely to be available on a wheat farm is a self-sown crop, or a crop foul with black oats. When a paddock becomes dirty with oats, a good plan would be to plough early, give a light seeding with an early maturing wheat or oats, and cut green, say in October in ordinary seasons, so as to get the work finished before hay making. The crop should be cut with a binder as the sheaves are much easier to handle than loose stuff. Carting should be done as soon as possible after cutting, in order that no seed shall fall out. If the whole of a paddock is cut, stock may be turned in to pick up any odd heads which may have been dropped. The land can then be cultivated, the one-way disc being probably the quickest method, and it will be ready for autumn sowing. I may say that I did this some years ago as an experiment, and it was a success in every way. Other material may be obtained from the outsides of crops, which often contain weeds; seeds will not germinate after coming out of an ensilage pit, so there is no danger of noxious weeds being distributed by stock which may be fed on it.

The growing of such crops as maize, sorghum, &c., specially for ensilage might well form the subject of another paper. On rich flats considerable quantities of barley grass, thistles, &c., may be cut, but the labour of handling material which cannot be cut and tied into sheaves is considerable, though experience has proved that any green stuff can be profitably used. A crop which would yield 1 ton of hay per acre would make about 3 tons of ensilage per acre, and about the same weight comes out of a pit as goes in.

Of the methods adopted the three principal ones are the stack, pit, and over-ground silo, with, of course, modifications of each. Of these the over-ground silo is certainly the best, but as it is expensive and requires machinery to chaff and elevate the material to get the best results it is not likely to be adopted by farmers in this locality, but for dairymen and large holdings, a silo is now recognised as being almost indispensable.

The stack, which is probably the cheapest, is also the most wasteful, and larger quantities are necessary than for a pit, which is what I favour. I made a stack about eight years ago, which I built to a height of 16 feet, and then put some fifty posts on top. This turned out, when opened up ten months later, to be splendid sweet ensilage, and was awarded the prize at the Wagga Show, with seven entries in the section. The amount of waste was, however, far too great in proportion to the good, and it was not all used quickly (having only a small number of stock to feed on it) it was continually drying until at the last only a small portion in the centre was really good, though stock ate the greater part of it.

Believing that the pit is the most suitable method for those who intend to make ensilage and leave it until needed, perhaps for several years, I shall endeavour to give a brief outline of this method. For large quantities, the pit is usually excavated with the plough and scoop in the shape of a trench, the size depending on the amount of material available. In my opinion a mistake is often made by having the pit so large that there is not sufficient material to get a good depth of stuff, and as the greatest waste is on the surface area, the lost material is out of proportion to that properly cured. With loose material the dray is drawn through the pit and the load pulled off and then spread, but with sheaves this is not advisable. A better plan is to stack the sheaves singly in the same way as hay, except that the bands are cut and removed and the surface kept as even and level as possible. Therefore I would consider it a better plan, after removing the greater part of the earth with the scoop, if the ends are finished with the pick and shovel, making them, like the sides, as nearly perpendicular as the nature of the ground will allow. The sides should be made as smooth as possible so as to have little obstruction to the material settling; for small quantities a square or circular pit may be made. As regards the site,

I would advise putting it near the crop, providing that the position is one that will enable stock to be fed at any time. It is much easier to cart the material to the pit than to cart the silage to the stock, the former being only a matter of a few days, while the latter may be an everyday job for months.

Before starting to fill the pit, the bottom may be covered with poles to allow a certain amount of drainage.

The best time to cut the crop is when it has reached the greatest bulk, certainly before it has started to ripen, and it should be carted before it becomes dry; in fact, the sooner it is stacked after cutting the better; rain or dew does no harm. It is not a good plan to stack too rapidly, as the material does not then reach the temperature necessary, for the curing is really a controlled fermentation. Should stacking be delayed, however, pressure should be applied, as otherwise it may get too hot. Provision may be made to ascertain the temperature, which should be about 130° Fah., by simply driving a sharp-pointed iron rod into the centre, leaving it there for a time, and if when drawn out it is too hot to hold in the hand, increase the pressure so as to exclude the air; if it can be held in the hand with ease, reduce the pressure or discontinue stacking for a time. If the iron is warm, and the temperature can be comfortably borne by the hand it is about right, and stacking may be continued. The object is to admit sufficient air to start fermentation, and then to check it when it has reached the right stage. Build the material well above the ground, so that when it has settled down the top will still be above the ground level. A pit 8 feet deep, and finished at 8 feet above the surface, should be about right when settled, though much will depend on the nature of the material and the tramping it has received. Cover with about 18 inches of earth, well built up in the centre to turn rain, and make provision to run surface water well away. The silage will be fit to use in a few months, or if properly made, it will keep for years. At the Sydney Royal Show in 1914, two samples of silage from Eunonyhareenyha Station, near Wagga, were shown in the Southern District exhibit, one being 11 years old and the other 9 years. These were pronounced by experts to be splendid samples, and my brother, who opened these pits, told me there were only a few inches of waste on the top, though grass was growing over them, and the only indication of the locality of one was the posts at either end which had been used to pull the loads off. One of these pits was filled with lucerne, barley grass, and other natural grasses which grew so luxuriantly on the river flats in the spring of 1903; the other was filled with chaffed sorghum.

As regards the amount to be fed, it is advisable to give small quantities at first, increasing the ration as stock get used to it. Where sheep have other dry or rough feed, 1 lb. per head per day is sufficient and up to 3 lb. when depending entirely on the silage. Only give what will be eaten up readily, as it rapidly deteriorates when exposed to the air, and once a pit or stack is opened it is best to remove a fair quantity each day.

One of the objections to silage is that hay is a more marketable commodity, but in a season like the past, the fortunate possessor of a supply of silage can either buy starving stock at a low price, and as the Yankees say "market it on the hoof," or sell the feed with the right to the run of the paddock which would be enriched by the droppings of the stock.

In conclusion, I should like to briefly point out a few of the advantages of silage. It is principally composed of what would otherwise be waste. It is safe from fire, mice, birds, or stock, and is good feed for cattle or sheep (especially lambing ewes), having a laxative effect on the bowels, and being a great milk-producer. The paddock is cleared of rubbish; no seeds fall out as with hay in stook, and seeds once through a silo will not germinate. The work can be done in the case of a self-sown crop, before the general harvest is started, and with sorghum or maize after harvest, thus not interfering with the busy time.

We have had bad seasons in the past, and we will have them in the future, so that it behoves us to make provision for that time, for it is well to remember that every beast saved is an asset to the country, and the richer the country the richer the inhabitants.

Coradgery.

Under the auspices of the branch Mr. J. G. R. Bryant, Assistant Fruit Expert, gave a very interesting demonstration on the pruning and planting of fruit-trees, at the orchard of Mr. E. A. Draper, "Harris Park," on 9th July.

Despite a very cold and wet day, there was an attendance of between twenty and thirty members and visitors, who were well rewarded, as the instruction was of a thoroughly practical nature. Mr. Bryant remarked that there was

really very little pruning to do this year, other than shaping the tree; but he indicated the method to follow so as to secure fruit each year, and to avoid a flush one season and nothing the next.

The Chairman (Mr. W. E. Tayler) proposed a hearty vote of thanks to Mr. Bryant, expressing his opinion that the Agricultural Department was doing good work in sending out experts to educate the farmers.

This branch held its monthly meeting at the residence of Mr. J. L. Whitmill, Wombin, on 17th July. There was an attendance of twenty members.

The meeting placed on record its appreciation of the services rendered to the district by Mr. W. R. Birks, B.Sc., Inspector of Agriculture, who had enlisted for active service.

It was decided to devote the proceeds of the branch's picnic to the Red Cross Fund.

Messrs. W. Elliott, H. N. Marriott, M. J. Kelk, and J. Clatworthy were asked to prepare papers on the most economical method of harvesting crops, for discussion at the next meeting.

Dubbo.

A demonstration of winter pruning was conducted by Mr. J. G. R. Bryant, Assistant Fruit Expert, on 29th July. There was a good attendance, and the Secretary reports that those present greatly appreciated the demonstration.

Garra and Pinecliff.

The weeds of the district were discussed at the July meeting of this branch, and it was agreed that the following were the twelve worst:—Star Thistle, Cat's Head, Wild Mustard, Paddy Melon, Black Thistle, Black Oats, Bathurst Burr, Couch Grass, White Weed, Mexican Poppy, Sorrel, and another unidentified.

Glenorie.

A new branch has been formed in this district, with twenty-one members to commence, and the following gentlemen have been elected office-bearers:—Chairman, Mr. P. H. Ebbott; Vice-Chairman, Mr. R. O. Stephens; Hon. Secretary and Treasurer, Mr. F. A. Nicholson.

The annual subscription has been fixed at 5s., and the regular monthly meeting is to take place on the first Saturday in each month.

Grenfell.

Mr. A. A. Patterson, Shire Engineer, Secretary (*pro tem*) of the branch, gave a practical demonstration on pruning at Mr. C. W. Harveyson's orchard in July.

Pruning Demonstration.

Mr. Patterson started his demonstration and lecture by showing the correct way of cutting the roots of a young tree before planting, illustrating how all damaged roots should be cut out with a sharp knife, and the roots be cut away so that the severed part faced downward; by so doing, the roots so cut would always send out a mass of nerve roots or feeders. On the other hand, if the cut of the root faced upwards, it had a tendency to send up suckers, which would weaken instead of strengthen the tree. The lecturer then showed the various methods of pruning according to difference in the age of the tree; young trees, he stated, should always be headed back about 18 inches from the ground, and only about three branches should be allowed to grow the first year. Pruning should

shorten the first year's growth back to within 12 or 15 inches of the crown of the tree, for the purpose of both forming and giving strength to the coming tree. It was also pointed out that apple-trees of different kinds required different methods of pruning; for instance: a Rome Beauty or a Jonathan required to be pruned in a different way to, say, a London Pippin (Five Crown), or a Granny Smith or Cleopatra. After the tree was four or five years old and after it had been properly shaped, as explained, the pruning for fruit-production should begin. On the London Pippin, Granny Smith, and Cleopatra, all lateral shoots should be cut back within 3 or 4 inches of the limb for the purpose of forming spurs so as to bring the fruiting down into the tree and on to the lower limbs.

In a climate like this, all fruit-trees should be made to bear low down as a protection from sun and wind. Trees like Rome Beauty and Jonathan do not grow their fruit on spurs, consequently if pruned in a similar manner to the Five Crown, there would be little or no fruit. Trees of this kind bear their fruit on the laterals, consequently the laterals must be left intact so as to force the fruit-buds out for the next season. It makes little or no difference how the laterals are growing—crossways or any other way—they can be allowed to tangle together as much as they like in the centre of the tree so long as there are not too many of them, and the bearing of the tree thereby overtaxed. Of course, when the fruit-buds have formed on the two years' wood, the laterals are shortened back for the purpose of producing more laterals as the tree increases in size and strength. It is often advisable, in all kinds of fruit-trees, particularly if the tree does not produce the quantity of fruit it ought to carry, to leave the vertical limbs intact for a year or two; it has been shown by so doing that fruit-buds will be forced out, instead of a continuous growth of young wood.

Mr. Patterson also explained and demonstrated the pruning of the peach, apricot, pear, plum, and quince tree, and the pruning of roses and their propagation by roots and cuttings.

About fifty farmers from the surrounding district were present, and appeared to take great interest in the demonstration. At the close of the demonstration Mr. Patterson was accorded a hearty vote of thanks.

On a subsequent evening in the same month Mr. Patterson delivered a lecture in which he covered a number of important aspects of fruit-growing.

Fruit-growing in the Grenfell District.

Outlining some of the considerations that should govern the selection of a site for an orchard, Mr. Patterson stated that the best all-round orchard soil is a free sandy loam containing a fair proportion of decayed vegetable matter, and naturally well drained; such a soil as will not stick to the spade or mould-board plough, and of such porosity that a hole dug 2 feet deep and filled with water overnight will be dry in the morning. For certain fruits, such as pears, apricots, prunes, and the better variety of plums, a richer and heavier loam—either red or dark brown—was preferred, as it produces fruit of superior quality and of finer texture than the lighter loams, which are better suited for peaches, nectarines, Japanese plums, apples, figs, almonds, oranges, lemons, walnuts, chestnuts, &c., though all fruits do well in such soils. The great advantages of a sandy loam soil in a district like Grenfell, he said, were the ease with which it could be cultivated, and its good moisture-retaining properties, especially where it was fairly rich in decayed vegetable matter. There was any quantity of good fruit soil in the district, so there was no need for an intending orchardist to rush the first piece of land that offered. In any case a spade should be used to thoroughly test the ground in several places; a test should also be made as to natural drainage, and any land through which water did not soak away, as described above, would not grow any fruit properly, especially cherries, apricots, peaches, and citrus fruits; these were all injured by stagnant water in undrained land, the first effect of which was to cause gumming, which either seriously injured or killed the tree.

Mr. Patterson advocated thoroughness in the preparation of the land, careful attention to detail in the planting, and clean cultivation. Of varieties he considered suitable for the district he mentioned the following:—Apples—Jonathan, Rome Beauty, Granny Smith (three of the world's best), and next to them King David, Delicious, Statesman, Dougherty, and McIntosh Red; Pears—Williams' Bon Chretien (also known as the Bartlett pear), Packham's Triumph, and Bailey's Bergamot; Peaches—Elberta (a freestone and one of the very best); Apricots—Early Moorpark and Large Orange; Plums—Gloire de Epinay, Imperial de Milan, and the Japanese Blood Red "Satsuma"; Prunes—Prune d'Agen (French prune).

Hay.

At the regular monthly meeting in July Mr. McRae (Chairman) presided and there was a fair attendance.

A discussion of some length took place regarding bush hay and ensilage, at the conclusion of which Messrs. M. T. Little, D. J. McRae and F. Headon agreed to prepare papers for a future meeting.

The Secretary urged those present to secure members in order to strengthen the branch and increase its usefulness to the district.

Katoomba.

Mr. H. Hicks presided at the monthly meeting of this branch, held on 3rd August. The attendance was fair, and some new members were enrolled.

Amongst other matters, a discussion took place on the necessity for completion of the road from Katoomba to the Megalong Valley, which would open up a vast area of good agricultural land and supply a considerable quantity of produce to Katoomba—notably fresh milk and butter, which is at present brought mostly from Sydney, and is somewhat stale before being distributed on the mountains.

Keepit (Manilla).

A re-election of office-bearers took place at a meeting held on 4th August, resulting as follows:—Chairman, Mr. James Gardner; Vice-Chairmen, Messrs. H. V. Dow and E. A. Porter; Hon. Secretary and Treasurer, Mr. J. B. Fitzgerald.

Meetings are to be held in future on the first Wednesday in each month, at 2·30 p.m., at Mr. Gardner's farm.

Lankey's Creek (Jingellic).

The monthly meeting was held on 24th July, and as it was the anniversary of the formation of the branch, office-bearers were elected for the ensuing year as follow:—Chairman, Mr. C. Hope; Vice-Chairmen, Messrs. M. Wright and T. W. Gadd; Hon. Secretary and Treasurer, Mr. G. J. Nichols.

Leech's Gully.

There was a good attendance of members at the annual meeting, held on 26th July. The Secretary submitted his report, making mention of the great advantage of the Bureau to farmers, in that they are enabled to meet monthly for the purpose of exchanging ideas and discussing matters of importance to farmers generally. The Treasurer's report and balance-sheet disclosed the handsome credit of £15.

The election of office-bearers for the ensuing year resulted as follows:—Chairman, Mr. A. Mansfield; Vice-Chairmen, Messrs. J. Leech and P. Sommerlad; Treasurer, Mr. J. Donnelly; Hon. Secretary, Mr. G. R. Smith; Auditors, Messrs. S. H. Dowe and J. T. Weir.

Mangrove Mountain.

On the 19th July Mr. J. G. R. Bryant, Assistant Fruit Expert, visited this branch and gave a pruning demonstration on deciduous trees at Mr. L. Roseby's orchard.

There was a large and very enthusiastic attendance. Mr. Bryant spared no pains to impart knowledge to those seeking it. so much so that the members look forward to another visit from him in the future.

Two new members joined the branch.

Middle Dural.

The monthly meeting of this branch was held on 25th June.

Mr. Arthur Boot was elected Chairman, and Mr. C. W. Roughley Vice-Chairman, for the ensuing year. The election of Hon. Secretary and Treasurer will be arranged later.

A paper was read by Mr. J. Thacker on preserving fruit, the use of compressed steam being advocated as the most economical method where the work is done on a fairly extensive scale. It was pointed out that the operation is a profitable one, as indicated by the prices paid by the public for canned fruit. A small plant suitable for the purpose was produced, and the operations at each stage carefully explained from the filling and heating of the tins to the final soldering down.

Mittagong.

Under the auspices and at the request of the Mittagong branch, an instructive and entertaining lecture on beekeeping was given on 8th July, by Mr. R. G. Warry, Demonstrator in Apiculture. The busy bee and its habitat were fully described with the help of slides thrown on the screen.

At the end of the lecture a vote of thanks was accorded Mr. Warry for his lecture and Mr. H. Stevenson for manipulating the lantern.

Narrandera.

A lecture was delivered by Mr. H. C. Stening, Inspector of Agriculture, to the members of the above branch on 24th July.

The subject of the lecture was " Wheat Culture in Dry Districts." At the conclusion of the lecture questions were invited, and the following are some of those asked, together with the replies:—

Question.—You mentioned that most of the early-maturing varieties were poor stoolers; which of them, suitable for hay, stool best?

Answer.—Thew, Florence, and Comeback are the best stoolers among the early varieties, and these are all suitable for hay.

Question.—Do you consider that it would be sufficient to pickle seed every second year?

Answer.—No, it is a risky practice to sow untreated seed at any time. I would strongly advise that, whatever the conditions may be, all seed should be carefully pickled before sowing.

Question.—Would harrowing a crop be an advantage if the crop is intended for hay?

Answer.—Harrowing a crop, by creating a soil mulch, conserves moisture in the soil, which in most seasons not only assists in the full development of grain, but also increases the hay yield. Harrowing is particularly advantageous when performed in early spring, before the crop is too high, at which time the surface soil often becomes crusted.

Question.—What is your opinion of formalin for pickling wheat?

Answer.—Good results have been obtained by treating wheat with a solution of 1 lb. formalin in 40 gallons water. The results of tests, however, have proved a 1½ per cent. solution of bluestone to be a more efficient fungicide. As with the bluestone treatment, so also with the formalin, the vitality of some of the grain is destroyed. This can be largely reduced in the case of the bluestone, however, by the use of lime.

Nimbin.

At a discussion on maize-growing, reported in our June issue, it was mentioned by Mr. Geo. Eaton that it did not pay to grow the variety Leaming when better results were obtainable from Early American Wonder. It now transpires that the Leaming referred to by him was a crop grown by one of his neighbours, who calls the variety "Early Leaming"; it is of red colour. Mr. Eaton declares that the Leaming maize supplied to him from the Grafton Experiment Farm is the best mid-season variety of maize he has ever grown.

On 5th August, Mr. C. W. Burrows, Assistant Inspector of Agriculture, gave a demonstration in the use of explosives at Miss Eckford's farm.

Explosives in Clearing.

A large tough tallow-wood log was chosen, and two holes bored in it about 9 feet apart, in each of which five plugs of gelignite were placed and the holes filled up with loose earth. These charges having been connected with the battery, the log was soon shattered and splintered along one side and left ready for burning.

Next a large stump was operated on by making three deep holes under it with a bulb-bar and charging each with about ten plugs of gelignite. The earth was blown well out from under the stump, which was raised slightly by the explosion and shattered ready for burning.

A tall, dead bloodwood tree was next charged in five places, forty-eight plugs being placed under and in it. The result was that the rubbish was thrown from under, and the tree was raised a little and cracked ready to burn. The charges in this case, too, were connected by wires and cable with the battery at a distance.

A smaller stump was operated on last with five plugs of gelignite, and fired by a fuse, to show how to use the fuse where a battery is not employed.

A hearty vote of thanks to the demonstrator was carried by acclamation.

Mr. Burrows in reply said, it was not his object to blow stumps and trees sky-high, as that would be too expensive, but simply to demonstrate how to make them easier to burn. Practice would teach how much explosive to use for different sized trees and stumps and how to cut down the cost. Cross-burning logs was slow work, but if they were shattered first it was quite a different thing.

The Secretary (Mr. J. T. Hutchinson) proposed a vote of thanks to Miss Eckford for providing a first-class lunch and for permitting her land to be used for the demonstration. He also explained the objects of the Bureau, and invited others to join and thus profit by the useful discussions that members often had.

Ponto.

The papers subjoined were read at the meeting of this branch on 23rd July, the first by Mr. A. D. Dunkley, and the second by Mr. A. T. White.

Vegetable Growing.

Those who intend planting any summer vegetables this year should get the plot ploughed up as soon as possible, if that has not already been done. This should be a very good year for summer crops if the abundance of moisture which is now in the soil can be conserved, and this can be done to a great extent by proper attention to cultivation. In a district such as ours every care should be taken to conserve as much of the winter and spring rains as possible.

I am convinced that in nearly all cases where an attempt is made to grow summer vegetables in this district the plants are placed far too close together. When planted too thickly, the plants grow well for some time, but if a dry spell sets in the available moisture becomes exhausted, and before any crop is ripened, the plants are very much drought stricken. It would be well if we were to consider for a moment, before planting, the possible length of roots of the special plant which we desire to grow, and then plant accordingly. It is a very common thing to see people planting extra thickly on account of not having much room in the plot. The idea of this is, probably, to obtain a large crop off a small area, which, however, cannot be done without irrigation.

WHEAT CULTURE.

In my opinion, wheat is too often chosen for its yielding qualities only, regardless of many other desirable characteristics. The aim of each producer should be to select varieties that can be considered from many standpoints, such as evenness in height of ears, strength of straw, yield, freedom from shelling under adverse conditions, good milling sample, disease resistance, &c., and a most important factor every time is adaptability to local conditions. In the matter of soil, wheat is exacting, but provided the right variety is sown, a satisfactory yield can be obtained.

The advantages of pure seed are manifold. As there are so many varieties with such different characteristics, to sow mixed seed must lead to considerable loss. For instance, a crop comprised of a mixture of Federation, the taller Steinwedel, Comeback (an early maturing wheat), and Purple Straw, would result in the Comeback and Steinwedel ripening whilst the Purple Straw was still verdant, and the Federation would be as an undergrowth amongst the others. The preventing of wheat getting mixed, however, is rather a difficult and a well-nigh impossible task, but much can be done towards this end if the precaution be taken to thoroughly clean seed drills and harvesters before commencing to handle another variety. It is hardly necessary to mention that the period of sowing must always depend on the season, variety of wheat, nature of soil, &c.

Pyangle.

A fair number of members attended the monthly meeting of this branch held on 7th August.

A lengthy discussion took place regarding the advisability of constructing a centrally situated sheep dip for the use of small flocks from the surrounding districts.

Stockinbingal.

The monthly meeting of this branch was held on 24th July, when the business for the evening was a discussion on lucerne growing and fallowing.

Mr. E. J. Perkins opened the discussion on lucerne growing and preparing the land for sowing. He stated that he had sown 34 acres of lucerne in August, 1914, on fallow land that had been worked twice with a disc cultivator. He used 7 lb. seed and 40 lb. superphosphate per acre, and although the season was very dry, the lucerne was growing well. He was in favour of sowing in July or August in this district.

Mr. B. Witenden opened the discussion on fallowing. He favoured fallowing generally, but thought that in wet seasons better results might be obtained from unfallowed land, as the fallowed land would hold too much moisture and cause the plants to scald

Mr. G. Langdon and Mr. M. Poole both spoke in favour of fallowing in any season. As there was not sufficient time to fully discuss the subject, the meeting decided that the discussion on fallowing be continued at the next monthly meeting, when the subjects of conserving moisture and rotation of crops would be under discussion.

A demonstration of land clearing and subsoiling with explosives, given on 10th August, by Mr. C. W. Burrows, Assistant Inspector of Agriculture, proved very successful. The demonstration was witnessed by sixty-four persons.

Tatham.

Mr. C. W. Burrows, Assistant Inspector of Agriculture, conducted a demonstration of the method of clearing by means of explosives for the benefit of members of this branch on the 28th July. About forty farmers were present and showed a keen interest in the proceedings.

With a large auger, three holes were bored in the base of a big ironbark tree and charged with gelignite, and another charge was placed underneath the tree about 3 feet below the surface of the ground. A detonator was placed in each charge, and all connected by insulated wire to a cable which led to a small dynamo some 5 chains away. All the charges were exploded simultaneously, completely shattering the lower part of the tree.

The demonstrator carefully explained the use of detonators, and the necessity of being careful in handling them, as a pin-prick or jar might explode one and damage the hand. He also pointed out that it was more economical to shatter the tree, so that it would burn easily, than to attempt to blow it clean out of the ground.

A charge was placed in the pipe of a box stump. The pipe was then packed with earth and fired with a fuse with a satisfactory result.

Temora.

A meeting of the branch was held on 2nd July, when Mr. W. de Little presided.

Noxious Weeds.

The Department of Agriculture desired that the Branch should submit a list of noxious weeds of the district.

The list decided upon was as follows :—Bathurst Burr, Star Thistle, Wild Mustard, Saffron Thistle, Wild Poppy, Tumble Weed, Wild Hollyhock, and Cape Weed.

It was decided to state that most of these weeds could be fed off.

Mr. Sinclair contended that any weed which could be killed by stocking the land should not be classed as noxious. By starving the sheep to a certain extent they will keep any thistles under.

Opinion differed as to whether Cape Weed should be included. Though generally agreed to be a noxious weed, it was stated to be a good sheep feed. Members stated that the weed had been in Victoria for many years, and was brought here by carriers in the days of the Temora diggings.

A paper on the depth to sow wheat was then read by Mr. de Little

The Depth to Sow Wheat.

This was the subject for discussion at the last meeting of the branch, the question being prompted by the bad germination in some cases of wheat sown early this season. With all conditions of soil favourable, wheat may be sown safely to a depth of 3 or even 4 inches, but in the case of early sown wheat, when the soil is loose and dry, I am of opinion that the closer to the surface wheat is sown the better. This season a certain amount of wheat has been known to make a shoot and roots, and then these have to all appearances died. After the general rain, wheat shoots appeared, but so thin as to suggest that a great many of the grains that had started growing had rotted. Has this bad germination occurred at all depths, or only where wheat has been sown over 2 inches deep? Nature sows very shallow; in fact, only a covering of dust, and the germination seems to be always satisfactory. Probably the older members will say that germination from broadcast sowing was more satisfactory than in these days of drilling. If so, it points to the fact of wheat being sown too deep with seed drills. Superphosphate and bluestone are both blamed for faulty germination, but I am coming to the conclusion that deep sowing is the real fault.

Mr. J. Schebuhm considered that it was very hard to say what was the correct depth to sow as a standard, his opinion being that the sowing should be regulated by seasonal conditions then obtaining. In the old days, instead of broadcasting, they used to plough-in the grain, and this was better than sowing with a drill. This year the early showers shot the wheat, but made a hard crust, which prevented the young shoots from getting through if sown deep. The grain sown near the surface came through fairly well before the surface soil had hardened.

Mr. J. T. WARREN agreed that the depth of sowing depended on the seasonal conditions. Years ago in the Gunbar district he had ploughed the grain in with a 10-furrow plough. The soil was light, and the depth of ploughing from 3½ inches to 4 inches. He found that even when sown on the surface the seed generally got down to the full depth at which the plough was set. In 1894, the last of the very wet years, in each paddock there were patches of land not sown in the general seeding operations. These were afterwards sown on the surface and harrowed in, and gave far superior growth to that sown under the other conditions. If seed was sown in a dry soil the young plants found it much harder to break through the surface than when planting was done after the first rainfall. In his opinion 1½ inches was a very safe depth to sow Now that drills were being made so wide he was of the opinion that they should be made in two sections, and more flexible. He had been sowing about 2½ inches deep throughout.

Mr. J. DONALDSON agreed that a depth of 2 inches was sufficient. A good deal, however, depended on the year. He had seen a self-sown crop give a good return, which led him to believe that the seed did not require to be sown very deep.

MR. D. SINCLAIR approved of the opinion (in the main) expressed by Mr. de Little. Farmers must sow according to the condition of the land. If the soil was dry on top and damp underneath, even to 3½ inches, it was well to put the seed down on the damp soil. The plant would then soon come through to the surface, If sown in a dry seed-bed, it was better to sow on the top. If buried deep and with insufficient moisture to carry the plant to the top, it would suffer from dry rot, while if the plant came up it would not be able to get through the surface.

Mr. N. FREEBORN agreed with the previous speaker's remarks that the depth of sowing depended on the condition of the soil. It was often found that the grain sown deep with a moist subsoil would send shoots to the surface before shallow-sown grain in a dry soil.

Mr. A. BUSHELL considered a depth of 2 inches the best for general cultivation. As he had not pickled any of his seed before the rain fell he thought that the manure had caused faulty germination. He had used about 40 to 45 lb. of manure to 45 lb. of seed.

Mr. SCHLIEBS considered that in ordinary years sowing from 1½ inches to 2 inches would be sufficient.

Mr. INGRAM had made experiments in sowing at various depths, and had got the best results from 1½ to 2 inches.

Mr. DE LITTLE was of the opinion that a man must use brains and sow according to the condition of the soil and moisture. He had been getting very bad germination. He had experimented with different strengths of bluestone pickle, and thought that his methods may have been at fault He therefore secured other good seed and sowed it close to the seed previously treated, with no better results. This year he was resowing 120 acres owing to faulty germination. He dug up hundreds of the seeds and found them to be 4 inches deep. The seed had germinated in many cases, but could not get through the hard crust of surface soil. He replanted them, and got good results. He was now convinced that he had been sowing too deep.

DEPARTMENTAL NOTE —The Department's experience has been that under favourable conditions, 2 to 2½ inches is deep enough to sow, except when an immediate germination can be ensured by sowing 3 inches deep, and the plant be thus enabled to reach the surface before the top soil has set hard. If a sowing is being made toward the end of June, quicker germination can be ensured by sowing at 1½ inches, provided the drill is in good order and the soil in such condition that the seed will be uniformly covered.

Upper Belmore River.

The Secretary has reported that ten new members were enrolled at the annual meeting of the branch held recently. There is thus a prospect of this branch becoming much stronger.

The monthly meeting was held on 21st July Mr. J. M Bannon presiding. A debate took place on the industry—new to the Belmore River—of making Buffalo hay. The grass grows naturally here, and this year, owing to the scarcity of fodder in other districts, it became known as a fodder and a sale was obtained for it. Many people went in for making a living out of it, and at the time of the meeting a ton of the hay was worth £5 10s., and an average acre yielded from 9 to 10 tons. It requires no cultivation whatever —simply fencing off a portion of the paddock for a season and letting the grass grow.

Orchard Notes.

W. J. ALLEN.

SEPTEMBER.

Spraying.

It is advisable to spray trees which have in previous years shown signs of fungus diseases, such as Peach-leaf Curl, Brown Fruit Rot, Black Spot or Scab of the apple, and other fungus diseases. Bordeaux mixture and lime-sulphur will be found the best sprays at this time of the year for all such diseases. Never spray any trees or vines when they are in bloom, as the chances are that the crops will be destroyed. They may be sprayed with the mixture at winter strength up to a week before coming into bloom, and again—at summer strength—a week after the fruit is set. It should be noted, however, that only summer strength should be applied after the leaf buds on vines and trees have begun to open. The formulæ for the preparation of these sprays at their various strengths will be found in Bulletin No. 72, which may be obtained free on application to the Under-Secretary and Director, Department of Agriculture.

Codlin Moth.

Spraying with arsenate of lead for codlin moth is now compulsory, and growers should begin the application in accordance with the regulations. The exact time must be governed by the district in which the grower resides. Soft water should be used for diluting the arsenate of lead; rain water is most suitable.

As a reminder to orchardists, the regulations that were gazetted on the 13th October, 1914, under the Vine and Vegetation Diseases and Fruits Pests Act, 1912, are given in full :—

TREATMENT.

(a) All apple, pear, and quince trees, and suckers, shall be sprayed effectively not less than three times with an approved brand of arsenate of lead, in the proportion of not less than eighteen (18) ounces of dry arsenate of lead powder —or its equivalent of arsenate of lead paste—to each fifty (50) gallons of water, or with such other substance, or mixture, as the Minister may direct in the *Government Gazette*. Such spraying shall be carried out in the following manner—that is to say, the first spraying shall be completed within five (5) days after the petals have fallen from the flower. The second spraying shall not be begun before four (4) weeks after the petals have fallen from the flower, but shall be completed within six (6) weeks after such petals have fallen from the flower. The third spraying shall not be begun within nine (9) weeks after the petals have fallen from the flower, but shall be completed within ten (10) weeks after such petals have fallen from the flower.

Provided that if, in the opinion of an inspector, the spraying has not been effectively carried out—or if he deems another spraying necessary—the Minister may require the occupier or owner to apply a fourth application in a manner to be directed.

(*b*) All apple, pear, and quince trees, shall be kept clear of dead bark and broken limbs, and all cavities or crevices which may prove shelters for codlin moth shall be cleaned out effectively. If any supports or other materials or objects attached to or used in connection with any such trees are likely to convey any fruit pest, such support or other materials shall be removed and destroyed.

(*c*) Fruit cases or other packages in which infected fruit or plants have been packed, or which are deemed likely to convey fruit pests, shall be either treated by immersion in boiling water for two minutes, or destroyed by burning.

In order that orchardists may be enabled to utilise many of the various brands of arsenate of lead at present on the market, the following table has been compiled by the Chemist's Branch, to whom samples have been submitted for analysis.

TABLE showing weight of various brands of lead arsenate paste to be taken in order that the resulting mixture shall contain as much dry lead arsenate as is equivalent to "18 oz. of arsenate of lead in the dry state to each 50 gallons of water."

Brand.	Weight to be taken. lb. oz.	Brand.	Weight to be taken. lb. oz.
Swift's	2 0	Hemmingway	2 0
Electro	1 11	Sherwin Williams	2 6
Foster's	2 11	Lewis Berger	2 0
Blue Bell	2 2	Federal	2 3
Red Seal	4 3	Austral	1 9
Nichol's or Our Jack	1 14	Carlton	2 5
Platypus	3 6	Vallo	1 14

Cultivation.

In all cases the orchard should be kept in thorough condition, as the future crop depends so much on the state in which the trees and soil are kept during the summer months.

Drying winds and hot days may be confidently expected, so that cultivation must proceed with regularity. Frequent stirring of the soil with spring-tooth cultivators serves to aërate it, and create a dust mulch which is useful in the conservation of soil moisture. Where the rainfall is heavy—and the orchards are situated on hillsides—shallow ploughing will have to be resorted to, as the working of the soil into a fine state of division may cause erosion.

Loosening Soil around Trees and Vines.

All soil should be loosened—either with a fork hoe or chipping hoe—around trees and vines; and all couch grass, sorrel, or other weeds, removed and burnt. This work should be carried out in the early spring—while the soil is moist and easy to work.

The Cumberland orchardists uses a very good type of fork hoe, which is made by local blacksmiths at Castle Hill, Dural, and Baulkham Hills. It is especially suited to orchard work, and should be used by those who have much hoeing to carry out. Dutch hoeing around trees and vines is very useful in the warm weather to kill spring weeds, and the work can be expeditiously carried on—the soil, of course, is kept from setting at the same time. It is hoped to illustrate this fork in the next issue.

Planting Citrus Trees.

This work should be completed before the dry weather sets in. The ground should be well worked, and in a friable condition.

In the dry, inland districts, a good soaking of the soil should be given before planting. After planting the young citrus trees should be cut back in the same manner as a deciduous fruit tree to form a head. There is a great future for the citrus industry, and farmers in districts such as Gilgandra, Dubbo, Narromine, and, in fact, in any of our back-country districts south, west, or north—where irrigation can be provided—would do well to have a few acres.

Pruning Citrus Trees.

Citrus trees should receive an annual thinning out. Dead wood, and old worn-out and dying shoots throughout the body of the tree, should be removed. A copy of the Department's book on "Pruning" should be in the hands of every orchardist.

Wherever an orchardist is doubtful as to the pruning required for citrus trees, he should leave them alone rather than cut too much from them. Where soil and climatic conditions are suitable, good cultivation—with thorough manuring—keeps trees in excellent condition, with the result that the merest thinning-out of spent wood and weak shoots is all that is required. Under irrigation strong suckers often occur throughout the centre of the trees, especially after a liberal watering. These should be entirely removed.

Re-working Trees.

If done at once, it is not too late in the cooler districts to head back and re-graft old trees with varieties more suitable for market requirements.

Those without experience who wish to carry out this work should apply for Bulletin No. 63 on "Orchard Nursery Work—Budding and Grafting."

Budding.

Wherever the sap is running freely, and the bark lifts easily, this work should be pushed on amongst the young citrus stocks.

In re-working an old tree, it is well to put in plenty of buds, so that if a few do not take there will be enough left from which to start the new top. The bud should always be inserted about where it is desired to have a branch. This will ensure a well-formed tree, which should carry some fruit the second year.

As soon as it is discernible which buds have taken, the branch may be cut back. It will be found that these buds will soon make a growth, and they will then need to be tied to a stake in order to prevent them being blown off.

Government Stud Bulls available for service at State Farms, or for lease.

Breed.	Name of Bull.	Sire.	Dam.	Stationed at—	Engaged up till—
Shorthorn ...	Melba's Emblem (Vol. IV. M.S.H.B.)	Emblem of Darbalara (100 M.S.H.B.)	Melba 3rd of Darbalara (1058 M.S.H.B.)	Berry Farm ...	‖
" ...	Imperialist ... (183 M.S.H.B.)	Florio	Lady Nancy of Minembah.	Berry Farm ...	*
Jersey ...	Grenadin (imp.)	Attorney (9477)	Cyril's Carnation (imp.).	Yanco Farm ...	*
" ...	Trafalgar ...	Best Man ...	Rum Omelette	Cowra Farm ...	*
" ...	Kaid of Khartoum	Sir Jack ...	Egyptian Belle	H. A. College ...	*
" ...	Leda's Retford Pride.	Dinah's Lad ...	Leda's Angel..	Wagga Farm ..	‖
" ...	Goddington Noble XV (imp.)	Goddington Noble	La Franchise 3rd.	" ...	*
Guernsey ...	The King's Mirror	Calm Prince ...	Vivid (imp.)...	Woodburn ...	19 Oct., '15
" ...	Godolphin Moses (imp.)	Golden Hero of the Vauxbelets (1929)	Rosetta (6509)	Wollongbar Farm	*
" ...	Hayes' Fido (imp.).	Hayes' Coronation 3rd.	Hayes' Fi-Fi 2nd.	Wollongbar ...	30 Nov., 15
" ...	Claudius (imp.)	Golden Star II..	Claudia's Pride (imp.).	Murwillumbah ...	30 Dec., '15
" ...	George III ...	King of the Roses	Calm 2nd ...	Wollongbar Farm	‖
" ...	The Peacemaker	Calm Prince ...	Rose Petersen	Wollongbar Farm	‖
" ...	King of the Roses	Hayes' King ...	Rosey 8th (imp.).	South Kyogle ...	30 Jan., '16.
" ...	Lauderlad ...	Laura's Boy ...	Souvenir of Wollongbar	Mullumbimby ...	6 Oct., '15.
" ...	Belfast	King of the Roses	Flaxy 2nd ...	Tyalgum	29 Nov., '15.
" ...	Royal Preel ...	Itchen Royal ...	Hayes' Lily du Preel (imp.).	Murwillumbah ...	30 Mch., '16.
" ...	Alexander the Great.	Claudius (imp.)	Alexandrina of Richmond.	Warneton ...	27 Sept., '15
Ayrshire ...	Wyllieland Bright Lad (imp.)	Wyllieland Gleniffer (7229)	Wyllieland Sangie	Glen Innes Farm..	*
" ...	Isabel's Majestic	Majestic of Oakbank.	Isabel of Gleneira.	Grafton Farm ...	‖
Holstein ...	Sultan La Polka (imp. N.Z.)	King of Dominos (297 N.Z.H. & F.H.B.)	Princess La Polka (292 N.Z.H. and F.H.B.)	Berry Farm ...	*
Kerry... ...	Castle Lough Ranger (imp.)	Waterville Rover	Castle Lough Lizzie.	Bathurst Farm ...	*

*Available for service only at the Farm where stationed. † Available for lease or for service at the Farm where stationed.
‖ Available for special service where stationed upon application to the Under Secretary.

E

BULLS FOR SALE

AT HAWKESBURY AGRICULTURAL COLLEGE.

RED POLL.—Belmont Ajax (No. $\frac{1}{62}$): calved 7th January, 1912; colour, red; sire, Acton Ajax (imp.) (9,655); dam, Shamrock, by Magician (imp.) (5,021); from Spinster, by Laureate (imp.) (1,563) from Spot (imp.) (5,136 R.P.H.B.). Price, **30 guineas.**

AT BERRY EXPERIMENT FARM.

MILKING SHORTHORN.—Prince of Temora: date of birth, 1st March, 1914; colour, roan; sire, Cameo of Darbalara, (154 vol. iii, M.S.H.B.); dam, Primrose VIII of Darbalara (passed vol. iv., M.S.H.B.), by Emblem of Darbalara (100 M.S.H.B.) from Primrose of Bolaro (568 vol. i, M.S.H.B.). Price, **15 guineas.**

No record of dam. Calf allowed to suckle.

JERSEYS.—Wagga Aeronaut (315): calved 20th March, 1914; colour, whole fawn; sire, Grenadin (imp.); dam, Wagga Aitua (787 A.J.H.B.). Price, **12 guineas.**

Wagga Commander (319): calved 10th June, 1914; colour, whole fawn; sire, Aitua's Lad; dam, Wagga Clover (781 A.J.H.B.); Aitua's Lad, by Kaid of Khartoum, from Wagga Aitua (787); Kaid of Khartoum, by Sir Jack from Egyptian Belle (382); by Tidy Punch from Egyptian Princess (imp.) (65 A.J.H.B.). Price, **12 guineas.**

GUERNSEY BULL.—Desmond II: born October, 1913; colour, orange fawn; sire, Desmond, by Trequenor Mike (imp.) from Desdemona 8th (imp.); dam, Gertrude (62 A.G.H.B.), by Calm Prince (2 A.G.H.B.) from Beatrix XIV (imp.) (10 A.G.H.B.). Price, **30 guineas**

Milk yield :—	Milk lb.	Fat per cent.	Butter lb
Gertrude (3 months)	1,780	4·8	95·07
Beatrix XIV	6,791	5·0	400
Desdemona VIII	6,721	4·3	340

AT BATHURST EXPERIMENT FARM.

KERRY BULL.—Irish Lad: born 8th December, 1914; colour, black; sire, Killarney, by Kildare II, from Killiney; dam, Zena Dare, by Kildare II, from Bratha Dare, by Kildare (imp.), from Bratha 4th, by Belvedere Gay Knight (imp.), from Belvedere Bratha III (imp.). Price, **7 guineas.**

Milk yields :—	Milk lb.	Fat per cent.	Butter lb.
Zena Dare (7 months yield. Still milking) ..	5,502	3·84	216·14
Killiney (273 days)	6,772	5·1	395·96
Bratha Dare (273 days)	4,577	4·4	237
Bratha 4th (13 years old)	4,784	4·7	265·1
Belvedera Bratha III (imp.)	8,310	4·51	442

BULLS FOR SALE—*continued.*

AT GRAFTON EXPERIMENT FARM.

AYRSHIRE.—No. 42: born 27th March, 1914; colour, white and brown; sire, Jamie's Heir, by Jamie of Oakbank; dam, Belladonna of Russley, by Duke King of Ardgowan (imp.) from Belides; by Victor of Munnoch (imp.) from Bella (64 A.A.H.B.), by Gladstone from Beauty IV, by Cicero from Beauty III, by Nimrod from Beauty II, by Dunlop from Beauty (imp). Price, **12 guineas.**

No. 32: born 15th December, 1913; colour, brown and white; sire, Jamie's Heir, by Jamie of Oakbank; dam, Countess of Wollongbar, by Craigielea (542 A.A.H.B.) from Countess II of Gleneira, by Lad O'Kyle (imp.) from Countess of Gleneira (938 A.A.H.B.), by Edgar (177 A.A.H.B.) from Gaiety (1006 A.A.H.B.), by Dainty Davey from Princess, by Prince from Pet, by Fred from Scottie, by Ayrshire Lad. Price, **15 guineas.**

GEORGE VALDER,
Under Secretary and Director of Agriculture.

AGRICULTURAL SOCIETIES' SHOWS.

Secretaries are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 21st of the month previous to issue. Alteration of dates should be notified at once.

1915.

Society.	Secretary.	Date.
Albury and Border P., A., and H. Society	W. I. Johnson	Sept. 7, 8, 9
Young P. and A. Association	T. A. Tester	,, 7, 8, 9
Cowra P., A., and H. Association	E. W. Warren	,, 14, 15
Cootamundra A., P., H., and I. Association	T. Williams	,, 14, 15
Canowindra P., A., and H. Association	G. Newman	,, 21, 22
Temora P., A., H., and I. Association	A. D. Ness	,, 21, 22, 23
Northern A. Association (Singleton)	J. McLachlan	,, 22, 23, 24
Burrowa P., A., and H. Association	W. Burns	,, 23, 24
Millthorpe A., H., and P. Association	C. J. E. Hawken and R. Ewin.	,, 25
Murrumburrah P., A., and I. Association	J. A. Foley	,, 28, 29

AGRICULTURAL SOCIETIES' SHOWS—*continued.*

1915.

Society.	Secretary.	Date.
Wyalong District P., A., H., and I. Association ...	T. A. Smith ...	Sept. 28, 29
Yass P. and A. Association	E. A. Hickey ...	,, 29, 30
Hay P. and A. Association	G. S. Camden ...	Oct. 6, 7
Tweed River A. Society (Murwillumbah)	A. E. Budd ...	Nov. 10, 11
Mullumbimby A. Society	W. A. Davis ...	,, 17, 18
Lismore A. and I. Society	T. M. Hewitt ...	,, 24, 25, 26

1916.

Wollongong A., H., and I. Association	W. J. Cochrane ...	Jan. 13, 14, 15
Kiama Agricultural Society	G. A. Somerville...	,, 26, 27
Inverell P. and A. Association	J. McIlveen ...	Feb. 22, 23, 24
Newcastle A., H., and I. Association	E. J. Dann ...	,, 23, 24, 25, 26
Southern New England P. and A. Association (Uralla)	H. W. Vincent ...	,, 29, Mar. 1
Braidwood P., A., and H. Association	L. C. Chapman ...	Mar. 1, 2
Berrima District A., H., and I. Society	C. E. Wynne ...	,, 2, 3, 4
Tenterfield P., A., and M. Society	F. W. Hoskin ...	,, 7, 8, 9
Crookwell A., P., and H. Society	M. P. Levy ...	,, 9, 10
Nepean District A., H., and I. Society	P. J. Smith ...	,, 10, 11
Central New England P. & A. Association (Glen Innes)	G. A. Priest ...	,, 14, 15, 16
Coramba District P., A., and H. Association ...	H. E. Hindmarsh	,, 15, 16
Manning River A. and H. Association	L. Plummer ...	,, 15, 16
Gundagai P. and A. Society	A. Elworthy ...	,, 15, 16
Walcha P. and A. Association	J. N. Campbell ...	,, 15, 16
Camden A., H., and I. Society...	A. E. Baldock ...	,, 15, 16, 17
Macleay A., H., and I. Association (Kempsey) ...	E. Weeks... ...	,, 15, 16, 17
Armidale and New England P., A., and H. Assoc'n.	A. McArthur ...	,, 21, 22, 23, 24
Mudgee A., P., H., and I. Association	P. J. Griffin ...	,, 21, 22, 23
Crookwell A., P., and H. Society	M. P. Levy ...	,, 23, 24
Moruya A. and P. Society	H. P. Jeffery ...	,, 24, 25
Warialda P. and A. Association	C. O'C. Murray ...	,, 28, 29, 30
Orange A. and P. Association	W. J. I. Nancarrow	April 4, 5, 6
Quirindi District P., A., and H. Association... ...	C. G. Brandis ...	,, 4, 5, 6
Clarence P. and A. Society (Grafton)...	G. N. Small ...	,, 5, 6, 7
Cooma P. and A. Association	C. J. Walmsley...	,, 12, 13
Bathurst A., H., and P. Association	S. V. Turrell ...	,, 12, 13, 14
Upper Hunter P. and A. Association (Muswellbrook)	R. C. Sawkins ...	,, 12, 13, 14

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Agricultural Gazette of New South Wales.

Farmers' Experiment Plots.

MAIZE EXPERIMENTS, 1914–15.

North Coast District.

G. MARKS, Inspector of Agriculture.

THE maize experiments for the past season were planted on the following farms:—

A. McM. Singleton, Mondrook.
J. W. Smith, Wauchope.
R. Laney, Sherwood.
J. Burling, Upper Orara.
H. McLeod, Woodford Leigh.

Arrangements were also made for experiments to be planted on Mr. A. Pryor's farm at Coramba, but owing to his leaving the district they had to be cancelled.

The season 1913–14 was noted for droughty conditions which interfered with and consequently delayed plantings, and resulted in light yields and total failures, but in 1914–15 the opposite extreme was reached at the commencement of the season. Heavy rains and light floods, particularly in the Macleay, Hastings, and Manning Rivers districts, prevented farming operations being carried out on the lower lands, whilst on the higher levels, where land had been previously ploughed, plantings could not be made on account of the heavy rainstorms that occurred regularly every few weeks, and kept the lands in a constant state of saturation. As nut-grass infests most of the river bank farms it meant that as soon as the land was dry enough the whole of the areas speedily became covered with a luxurious carpet of this weed, and had to be reploughed before planting could be thought of. At Sherwood on the Macleay River, for instance, the land was got ready for planting in September, but before the planting had been effected in November the land had had to be reploughed and otherwise prepared on three successive occasions, owing to rain storms which resulted in over 20 inches of rain. There was a sufficient break between the storms to allow the flood waters to get away rapidly, otherwise the district would have been swept by a disastrous flood. Similar conditions existed at all the other plots. On the Manning and Hastings, 30 inches and 29 inches were recorded after the plots were planted, and of these amounts nearly three-quarters of the total fell during the early stages of growth. At Sherwood, 12 inches fell before tasselling was completed, and at a time when rain was badly needed dry conditions set in which continued more or less throughout the autumn.

Fertiliser Trials.

The experiments were in the main confined to trials of fertilisers, the variety chosen for these tests being Improved Yellow Dent.

The Manning Plots.—The land chosen for these experiments on Mr. Singleton's farm had been carrying dairy stock for many years. On this account, the heavy rains that fell here during the early spring did not interfere with the preparation of the soil so much as in other parts, where old cultivation lands were utilised. In fact, on account of the somewhat compacted nature of the soil, the season was distinctly favourable to the breaking up of new land. It is only fair to add, also, that upon this area it had been the custom almost daily for several years to feed the dairy herd and other stock with lucerne, both green and in the form of hay. Though the bulk of that conveyed to them was consumed, a small quantity of necessity became wasted through being soiled by the animals themselves. The total quantity, however, that had been wasted and decomposed on the surface for the many years that this system had been in vogue must have reached a fairly considerable amount, and this, in conjunction with the large accumulation of manure voided by the stock, must have added considerable fertility to the soil. In common with other areas, nut-grass was present, and continuous and systematic workings were necessary in order to keep the land in a reasonable state of cleanliness. Except in one instance, the best yields were obtained where no manure had been applied. The mixture W2 gave an increase of nearly 3 bushels per acre. A singular feature about these trials was the fact that the more superphosphate was used the lighter the yields became. As experiments during previous years have given indications of this, it would certainly appear that superphosphate should be applied with caution. As these trials were conducted under distinctly wet conditions, and those of the previous year under droughty conditions, it would be advisable to continue the experiments for another season at least before drawing definite conclusions. Rainfall, 30·11 inches.

The Hastings Plots.—The land on Mr. Smith's farm at Wauchope, where these plots were situated, has been in constant cultivation for very many years. The plots, which suffered from too much rain during the early stages, gave every indication of good yields. There was good germination, and a good "plant" generally, but just at tasselling time the district was visited with a couple of days of strong, hot, dry, westerly winds which seriously affected the fertilisation of the cobs. A continuance of dry conditions resulted in light yields throughout. In these experiments, the best yield was obtained from the unmanured plot, P5 coming next with but a few pounds per acre less. It was noticed however, that this plot exhibited a much darker green colour during growth than most of the others. There were differences in the yields of the superphosphate plots; 2 cwt. of superphosphate gave an increase of a little over 4 bushels per acre compared with 1 cwt., whilst 3 cwt. gave an increase of 2½ bushels over the 2 cwt. plot.

There is not the least doubt that if favourable conditions had existed at cobbing time the differences due to manures would have been more marked. Rainfall, 28·83 inches.

The Macleay Plots.—These were conducted on sandy alluvial soil on Mr. Laney's farm which has been growing maize continuously for upwards of half a century. Reference has already been made to the weather conditions at this centre. The "plant" was a little on the thin side, due to weevily seed. The 9 inches of rain that fell during November and December produced an excessive stalk development. During March, when rain was needed, only 9 points fell, which barely damped the surface. P5 here gave the best returns, yielding 6 bushels more than the unmanured; 1 cwt. of superphosphate gave 3 bushels more than the unmanured plot. It is interesting to note that here, too, the increase in the amount of superphosphate resulted in a diminution of yield. The 2 cwt. plot gave nearly 2½ bushels less than the 1 cwt. plot, and 3 cwt. per acre yielded 2 bushels less than 2 cwt. The P5 plot showed out throughout growth with its healthy dark green, and the results were not disappointing. Rainfall, 15·02 inches.

The Upper Orara Plots.—The land upon which these were carried out on Mr. J. Burling's farm consists of a light red loam. It has been under constant cultivation for very many years, in fact it is one of the oldest cultivation paddocks in the district. The rainfall was similar to that at the other plots, but a fire at the local post office caused rainfall observations to be incomplete, so that the totals are unavailable. Some exceptionally good yields were obtained as the result of the use of fertilisers. It is interesting to note that there was not such a greatly increased stalk development here as in most of the other plots, and the fertilisers appeared to result in increased grain yields rather than in excessive vegetative growth. The differences were most noticeable, and the increased size of the cobs in the field was readily discernible. The plot manured with P5 showed out conspicuously throughout, with its glossy dark green leaves. It yielded over 19 bushels per acre more than the unmanured plot. W2 came second with an increase of over 18 bushels. In the superphosphate plots, 1 cwt. of superphosphate gave an increase over the unmanured plot of nearly 4 bushels per acre; 2 cwt. of superphosphate further increased the yield by a little over 1½ bushels; but no further increase in yield was obtained by increasing the amount of superphosphate to 3 cwt. per acre. Owing to the great amount of rain and continuous showery conditions, great difficulty was experienced in keeping down weed growth, but be it said to Mr. Burling's credit, the plots were kept perfectly clean and this was the only clean maize paddock in the whole district. The key to success was tackling the weeds young and before they commenced to take possession. This meant taking full advantage of every fine, dry day until the weeds were mastered and the maize could look after itself. As these are the first maize experiments carried out in this locality, further trials are necessary in order to confirm the results already obtained.

The Woodford Leigh Plots.—The land upon which these were carried out, on Mr. H. McLeod's farm, is rich alluvial but inclined to be a little heavy. It has been under constant cultivation for probably over half a century. Wet weather interfered with the preliminary operations here also, but the plots were planted under good conditions as regarding tilth and moisture. The seed was weevily, and this in conjunction with a heavy rainstorm that compacted the surface soil shortly after planting, was responsible for bad germination. In consequence, fresh seed had to be procured and the plots replanted. Notwithstanding the unfavourable commencement a fairly good plant was obtained, but the season of maturing was delayed till late, and the crops encountered dry weather in consequence. It was fully anticipated that differences in favour of manures would be obtained, but it was the reverse that happened. For this locality 60 bushels per acre is considered a good crop, and the unmanured plot which gave the greatest yield made nearly 68 bushels. The next highest crop, 66 bushels, was obtained from 2 cwt. of superphosphate, but the increase of the superphosphate to 3 cwt. resulted in a decrease of nearly 1 bushel. The yield of the 1 cwt. superphosphate plot cannot be considered, as a neighbour's cow broke through the dividing fence and destroyed a quantity of the growing maize. The mixture P5, which promised well during growth, only yielded 54 bushels. W2, giving 60 bushels, fell behind the unmanured plot by nearly 5 bushels, but the plant was not quite as desired, and further tests under, it is hoped, more favourable planting conditions, will be carried out during the coming season before definite conclusions are drawn.

Variety Trials.

The variety trials were confined to two varieties, Improved Yellow Dent and Leaming. On the whole, Leaming gave the better yield, but this was principally due to the fact that more favourable weather conditions prevailed at cobbing time with Leaming than with Yellow Dent.

Rate of Seeding Trial.

An experiment in the rate of seeding was carried out at Mondrook, Wauchope, Sherwood, and Woodleigh. While the results are interesting, these are somewhat inconclusive owing to the climatic conditions.

MAIZE FERTILISER TRIALS (GRAIN), 1914–15.—North Coast District.
Variety: Yellow Dent.

Manure per acre.	Mondrook.	Wauchope.	Sherwood.	Upper Orara.	Woodford Leigh.
	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Superphosphate, 1 cwt. ...	80 53	45 21	47 41	65 32	*48 51
„ 2 cwt. ...	79 7	51 9	45 21	77 8	66 0
„ 3 cwt. ...	71 53	53 43	42 30	77 8	65 17
No manure	81 12	54 15	44 26	61 43	67 43
P5, 1¼ cwt.	71 32	54 3	50 35	81 3	54 18
W2, 1¾ cwt.	83 50	50 50	44 17	80 29	60 39

* Not comparable; portion destroyed by cattle.

MAIZE VARIETY TRIAL (GRAIN), 1914-15.—North Coast District.

Unmanured.

	Mondrook.	Wauchope.	Sherwood.	Upper Orara.	Woodford Leigh.
	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Yellow Dent	81 12	54 15	44 26	61 43	67 43
Leaming	85 10	51 60	49 40	62 44	*30 0

* Weevily seed; not half germinated.

MAIZE SEEDING TRIALS (GRAIN), 1914-15.—North Coast District.

Variety: Improved Yellow Dent.

Seed per acre.	Mondrook.	Wauchope.	Sherwood	Woodford Leigh.
	bus. lb.	bus. lb.	bus. lb.	bus. lb.
8 lb.	......	47 44	54 14	54 0
10 lb.	88 34	49 28	41 38	54 0
12 lb.	98 11	49 16	......	57 48

The following was the composition of the manure mixtures used:—

P5 mixture:—

4 parts superphosphate.
1 part sulphate of potash.

W2 mixture:—

6 parts superphosphate.
3 parts sulphate of ammonia.
1½ parts sulphate of potash.

Central Coast District.

J. W. SHAW, Assistant Inspector of Agriculture

MAIZE experiments were planted at three different places in the Central Coast District, the names and addresses of the farmers who co-operated with the Department in carrying out the experiments being as follow:—

J. L. Ellis, Yarramalong, *via* Wyong.
J. Cromarty, Nelson's Plains.
A. F. Wedlock, "Abbotsford," Picton.

The experiments consisted of a trial of different varieties, and a fertiliser trial, in which applications of 1 and 2 cwt. superphosphate per acre, respectively, 1¼ cwt. of P5 mixture, and 1¾ cwt. W2 mixture, were tested against no manure.

At each of the centres, arrangements were made during the winter months to have the land ploughed early, and then allowed to lie in the ploughed state, so that the sun, air, and frost could act upon it. If maize land is treated in this way no trouble will ever be experienced in preparing a good seed-bed, provided, of course, rain falls while the land is lying fallow. If the weather conditions are dry during this fallow period, which is rather unusual in our coastal areas, some difficulty may be experienced in working the land into good tilth.

The plots at Nelson's Plains were planted late in December, the land being in splendid tilth, but shortly after planting a very heavy storm was experienced, and the land remained in a wet state for a considerable time, with the result that the germination was unsatisfactory. Owing to this, and the fact that no more seed was available, the plots were practically a failure, and were not harvested.

The Picton Plots.

The experiments at this centre were sown for fodder, the intention being to convert the produce from the plots into ensilage. The sowing was done with a thirteen-disc wheat drill, only two tubes being used, so that the rows were 3 feet 6 inches apart. It was originally intended to sow the plots at the rate of 25 lb. per acre, but while some varieties were sown at this rate, the average rate of seeding was approximately 21 lb. As there is a very great difference between the way in which the different varieties of maize run through the drill, dependent mainly on the size and weight of the grain, it is not always possible to set the drill so as to sow exactly the desired quantity per acre.

The varieties planted were Leaming, Boone County Special, Red Hogan, and Improved Yellow Dent. Red Hogan was the variety chosen for the manurial experiment.

Germination was satisfactory in all plots with the exception of Leaming. The seed of all varieties contained more or less weevil, and the only assignable reason for the poorer germination of Leaming, is that it must have been more weevily than the others. Despite the fact that the weather conditions were extremely dry after germination, all the plots made wonderful headway, due, no doubt, to the fact that every precaution had been taken to conserve all the moisture possible in the soil previous to planting. The difference in the growth between the unmanured plot of Red Hogan and the plots manured with superphosphate at the rate of 1 cwt. and 2 cwt. per acre was very noticeable, and was discernible right throughout the growing period. In fact all the manured plots were considerably better than the unmanured, but those manured with superphosphate alone—particularly at the rate of 2 cwt. per acre—were easily the best, as will be seen from the accompanying tables. As regards season, and the suitability of the different varieties for fodder, Boone County Special was the first ready to cut, and Leaming second. Red Hogan was considerably later than Leaming, and Improved Yellow Dent was the atest of all. From a fodder point of view, Improved Yellow Dent and Red

Hogan are much to be preferred to Leaming or Boone County Special, as the tables giving the yields show, although the plot of Leaming was not strictly comparable owing to the poorer germination.

Despite the fact that the season was by no means a favourable one for maize, the yields are particularly good, and show that if the land is thoroughly prepared prior to planting, and frequent cultivations are given the crop during the growing period, good yields of fodder can be depended on in the majority of seasons.

All the maize from the plots was chaffed and put into a tub silo, and an excellent sample of ensilage resulted.

The Yarramalong Plots.

At this centre the experiments were planted for grain. It was considered that December planting would be more likely to give the best returns in the majority of seasons, in preference to October or even November planting, as the later sowing would be more likely to catch the autumn rains (which can nearly always be depended on), whereas a crop planted in the earlier months would in all probability tassel during the hottest and driest weather, and as a result the yield would be considerably affected. Sowing, therefore, took place on 5th and 6th December. As the season turned out, earlier planting would have probably given better results, as good rains were received at the time when in the majority of seasons hot, dry weather conditions are the rule.

The varieties planted were Red Hogan, Improved Yellow Dent, Leaming, Boone County Special, Gold Standard Leaming, and African Standard. The rows were planted 4 feet 6 inches apart, and the seed sown with a dropper in hills about 32 inches apart, two and three seeds being dropped in each hill. Germination was very satisfactory in all the plots with the exception of African Standard and Gold Standard Leaming; this is accounted for by the amount of weevil in these two varieties. The plots made wonderful headway, despite the fact that the weather conditions were unfavourable, but during the latter part of February and early March, when the majority of the plots were tasselling, hot, drying winds were experienced, and as a result the plots suffered severely. Had it not have been for this unusual dry spell in March, excellent yields would have been obtained.

African Standard was the first variety ready to pull, Gold Standard Leaming and Boone County Special being next in the order mentioned. These varieties appear, as far as the writer could judge, to be of about the same season. Leaming was fit to harvest about three weeks earlier than Red Hogan, and Improved Yellow Dent was considerably later than Red Hogan. No experiment was conducted with different manures, but one plot of Red Hogan was planted without manure for comparison. All the other plots were manured with W2 mixture at the rate of $1\frac{3}{4}$ cwt. per acre. There was no noticeable difference during growth between the plot of Red Hogan manured as compared with the unmanured, and as the table giving the yields shows, there is no appreciable difference in the yields of these two plots.

In comparing the yields of the different varieties, it would be decidedly unfair to condemn Gold Standard Leaming and African Standard, as owing to the weak germination the yields of these varieties are not comparable with the others. It will be seen from the tables that the best yield was obtained with Improved Yellow Dent, with Red Hogan a close second. Owing to these varieties being later than either Boone County Special or Leaming, the rains in April proved of greater benefit to them than to the comparatively earlier maturing sorts. As far as the writer could judge, neither African Standard nor Gold Standard Leaming could be considered good fodder maizes, as the plants did not appear to produce much leaf, a very essential characteristic for this purpose.

TABLE A.—Showing Results of Green Fodder Trials at Picton.

Variety Trial.

Manured with W2 Mixture at $1\frac{3}{4}$ cwt. per acre.

Variety.	Yield.			
	t.	c.	q.	lb.
Leaming	14	12	2	16
Improved Yellow Dent	19	10	0	0
Boone County Special	14	6	3	18
Red Hogan	18	16	2	24

Fertiliser Trial.

Variety: Red Hogan.

Fertiliser.	Yield.			
	t.	c.	q.	lb.
W2 Mixture, $1\frac{3}{4}$ cwt. per acre	18	16	2	24
Superphosphate, 1 cwt. ,, ...	19	14	0	0
,, 2 cwt. ,, ...	19	18	3	22
P5 Mixture, $1\frac{1}{4}$ cwt. per acre	18	12	1	16
No manure	16	11	3	18

TABLE B.—Showing Results of Variety Trial for Grain, at Yarramalong.

Manured with W2 Mixture at $1\frac{3}{4}$ cwt. per acre.

Variety.	Yield.	
	bus.	lb.
Yellow Dent	47	44
Red Hogan	46	28
,, (unmanured)	46	12
Leaming	40	26
Boone County Special	33	12
Gold Standard Leaming	26	15
African Standard	24	34

South Coast District.

R. N. MAKIN, Inspector of Agriculture.

THE past season's maize experiments were conducted on the farms of the ollowing:—

- C. L. Lindsay, Unanderra.
- W. H. Cook, Unanderra.
- T. A. Bateman, Albion Park.
- J. Chittick, Kangaroo Valley.
- McDonald Bros., Milton.
- F. J. Staunton, Moruya.
- J. H. Martin, Pambula.
- Farm Homes, Mittagong.
- Berry Experiment Farm.

The experiments, as set out, were more varied and of much greater interest than formerly. In the grain section, experiments were conducted to test varieties—eleven all told—in order to ascertain their value in point of yield, period of maturity, &c. Trials with artificial fertilisers and seeding experiments, including hill sowing and single grain, were also carried out. In the fodder section the work was practically the same, the chief aim being to increase the bulk of green feed.

The Weather.

In 1914 the South Coast experienced one of the best springs on record, there being an abundance of rain; in fact, in some parts there was too much rain, and in several instances planting was delayed on this account. The attention of South Coast farmers must again be drawn to the advisability of draining their lands, and the remarks made in the August issue of the *Agricultural Gazette* in connection with potatoes again apply. With the new year a dry spell set in, which checked any plots which were cobbing at that time. Our plot at Pambula suffered severely just then. A great drawback was the fact that no cultivation could be carried out owing to the wet season, consequently weed growth became very rank, and the yields were thereby considerably reduced.

The Grain Trials.

Manurial trials in the grain section were sown at Albion Park, Kangaroo Valley and Milton respectively, Boone County White being used in each instance. On all plots the unmanured section yielded practically as well as those manured. Indeed, at Albion Park the best returns were obtained from the unmanured section; in a measure this may be accounted for by the fact that the drainage of that particular section happened to be better than others, but the real trouble lay in the fact that, owing to there being no opportunity to combat the weeds, the results hoped for from the manure were not seen in the maize, but in the weeds.

Manure was applied as follows:—Superphosphate at rate of 1 cwt. and 2 cwt. per acre, P5 mixture at $1\frac{1}{4}$ cwt. per acre, and W2 at $1\frac{3}{4}$ cwt. per acre; an unmanured section was included for comparison. In all cases there was good germination, and Boone County White proved its value under wet conditions, the quality of the cobs being very good. The land selected for the work was typical maize ground of the district, and the preparation for the crop was conducted in the usual way.

Variety Trials.

Two variety trials were sown, comprising eleven varieties. One plot, sown at Moruya, was destroyed by a plague of cutworms, and there we also lost a trial, hill v. single grain, from the same cause. The other variety trial sown at Pambula returned interesting yields, in spite of trying conditions. This plot was sown on the check system, 3 feet 3 inches apart each way, enabling easy cultivation. The best yield was secured from Improved Yellow Dent, Gold Standard Leaming being second. The yields were not high, but were satisfactory considering the season. In the period of maturity there was a marked difference among the varieties. Leaming, Hickory King, and Gold Standard Leaming were the earliest; Red Hogan, Improved Yellow Dent and African Standard the latest, and other varieties in the list were mid-season. Cornplanter failed to germinate and was ploughed up and the section re-sown.

The effect of the manure W2 was more apparent at Pambula than elsewhere on the South Coast plots; this was probably due to the fact that drier weather conditions prevailed there and to the crop having been sown on the check, which enabled weed growth to be kept down. There was a difference of over 35 bushels in favour of the manured plot against that without manure.

The Green Fodder Trials.

Five green fodder manurial plots were sown. They were situated one each at Milton, Mittagong, Berry Experiment Farm, and two at Unanderra. The manuring was conducted in the same manner as in the grain section, the manures being the same in composition and quantity. The seed was drilled in rows 3 feet apart, which is at the rate of about 20 lb. per acre. Owing to the wet season the weed growth became troublesome, and the returns were small as compared with other years.

At Mittagong the returns were very satisfactory, as this district is not considered suitable for maize. The plots were sown on poor ground and returned an amount of green feed which was considered profitable. Improved Yellow Dent was the variety sown.

At Milton a fine cut was obtained from Boone County White. This maize is undoubtedly suitable for fodder; it is earlier in maturing than Improved Yellow Dent, but it is doubtful whether the yield, when grown under equal conditions, would be as high. In several cases this season it was sown for fodder, as farmers had grain plots of the same variety and desired to keep the grain free from inoculation.

In the seeding trial an effort was made to determine the best quantity of seed to sow per acre for fodder. Owing to the difference in the manufacture of maize drills, especially in the sowing plates, the quantities of maize sown varied, but the tables show that the best results were obtained from sowing about 25 lb. of seed per acre. Sections sown with under 20 lb. of seed were too thin and weed growth easily established itself, while in those sown with over 25 lb. of seed the plants grew spindly with a tendency to lodge. In each case Boone County White was used; a lesser quantity of smaller grained

varieties would, of course, suffice, but of medium grained varieties 25 lb. per acre may be taken as a satisfactory seeding for green feed when sown in drills 3 feet apart.

MAIZE EXPERIMENTS, 1914–15.—South Coast District.

Grain Manurial Trial. Variety: Boone County White.

Manure per acre.	J. Chittick, Kangaroo Valley.	McDonald Bros., Milton.	T. A. Bateman. Albion Park
	bus. lb.	bus. lb.	bus. lb.
Superphosphate, 1 cwt. ...	66 0	50 0	40 40
" 2 cwt. ...	63 0	68 32	54 0
No manure	64 16	57 48	63 24
P5, 1¼ cwt.	62 28	51 24	61 16
W2, 1¾ cwt.	80 40	61 24	54 28

Grain Variety Trial at Pambula.

Manured with W2 Mixture, at the rate of 1¾ cwt. per acre.

Variety.	Yield per Acre.	Variety.	Yield per Acre.
	bus. lb.		bus. lb.
Boone County	46 0	Hildreth's Yellow Dent ...	41 32
Red Hogan	43 24	Gold Standard Leaming ...	63 0
Funk's Yellow Dent... ..	37 24	African Standard	34 0
Reid's Yellow Dent	45 28	Improved Yellow Dent ...	67 36
Leaming	39 16	Improved Yellow Dent unmanured	32 0
Hickory King	46 32		

Fodder Manurial Trial. Variety: Yellow Dent.

Manure per acre.	C. L. Lindsay, Unanderra.	McDonald Bros., Milton.*	W. H. Cook, Unanderra.	Farm Home, Mittagong.	Berry Experiment Farm.*
	t. c. q. lb.	t. c. q. lb.	t. c. q. lb.	t. c. q. lb.	t. c. q. lb.
Superphosphate, 1 cwt. ...	4 9 2 16	20 11 1 20	3 8 1 8	11 8 2 8	6 17 2 20
2 cwt. ...	9 17 0 16	17 11 3 4	2 17 0 16	10 8 2 8	7 7 0 16
No manure ...	6 17 0 16	14 7 0 16	5 14 1 2	6 5 2 24	3 14 1 4
P5	9 1 1 20	19 1 1 20	4 1 1 20	11 1 1 20	6 1 1 20
W2	9 3 3 20	17 17 2 0	4 17 0 16	12 17 0 16	failed.

* Boone County White was the variety used here.

Fodder Seeding Trial. *

C. L. Lindsay, Unanderra.		T. A. Bateman, Albion Park.		Berry Experiment Farm.	
Seed per acre.	Yield.	Seed per acre.	Yield.	Seed per acre.	Yield.
	t. c. q. lb.		t. c. q. lb.		t. c. q. lb.
25 lb. ...	13 2 2 0	35 lb. ...	19 12 3 12	9 lb. ...	5 17 0 16
20 lb. ...	11 4 1 4	30 lb. ...	18 14 1 14	11 lb. ...	6 9 0 12
15 lb. ...	8 15 2 24	20 lb. ...	15 11 0 8	16 lb. ...	7 2 3 12
....	....	....	....	18 lb. ...	7 18 2 8
....	....	....	....	20 lb. ...	9 14 1 4
....	....	....	....	26 lb. ...	7 8 2 8

* Boone County White was the variety used at Albion Park and Berry, and Yellow Dent that used Unanderra.

Northern and North-Western District.

F. DITZELL, Assistant Inspector of Agriculture.

Six maize experiment plots for grain only were conducted in four different districts last season, the following being the names and addresses of the experimenters—

Harding Bros., "Lochiel," Oakwood (Inverell District).
J. Ditzell, "Lansdowne," Inverell.
J. F. Chick, "Hillview," Tenterfield.
J. T. Cowin, Bryan's Gap (Tenterfield District).
J. T. Elliot, "Kelvin," Dangarsleigh, *via* Armidale.
J. Perry, "Killara," Quirindi.

The Inverell Plots.

There were fifteen plots, each 1 acre in area, in the Oakwood plots, and fourteen plots, each ¾ acre in area, in the Inverell plots.

Soil.—The Oakwood plots were situated on a red to chocolate clay loam, friable, rich, with a clay subsoil, which had returned thirteen crops of wheat and maize in ten years. The previous crop was wheat for grain. The soil at Inverell was a rich, black, friable alluvial, which had been under constant cultivation for thirty-seven years. The previous crop (maize for grain) had been manured with 1½ cwt. per acre of a complete manure.

Cultural Details.—The land for the Oakwood plots was mould-board ploughed 4 inches deep in January, 1914, and a good growth of self-sown wheat was obtained which was twice fed off by sheep. After careful preparation in the spring, on 5th, 6th, and 7th November the seed was drilled in the bottoms of shallow furrows and harrowed so as to cover it 4 inches deep. Two or three grains were sown at intervals of 30 inches, in rows 4 feet 9 inches apart. The eleven varieties sown in the variety trial were manured with 2 cwt. of superphosphate per acre. The growing crop was cultivated once with a tine cultivator.

For the Inverell plots, the seed was dropped by hand in drills 4 inches deep on 2nd and 3rd November, and was covered immediately by harrowing. Two or three grains were dropped at intervals of 30 inches. The drills were 5 feet apart. All the varieties were sown without manure, except one plot of Funk's Yellow Dent which received a dressing of the W2 mixture. Two extra plots of Funk's Yellow Dent were also sown, one with single grains every 15 inches, the other with introduced seed. The after cultivation consisted of two disc cultivations.

Season.—The season was one of the worst for maize ever experienced in the Inverell district. The rainfall between the first ploughing and the planting of each plot was: Oakwood (from August ploughing only), 376 points; Inverell, 368 points. The effective rainfall after planting was: Oakwood, 812 points; Inverell, 1,030 points. The very low falls in February and March were ineffective. The rainfall was very low in August and September, and the subsoil therefore lacked moisture. Fair rains in October ensured moist seed-beds, and a good germination in each plot. Then good falls in November, December, and early January gave the maize an excellent start, but no effective rain was afterwards received, and intensely hot weather in January simply scorched up the crops throughout the district, so that probably 50 per cent. of them proved failures while the others only gave from very light to fair returns. February and March were also very hot and most of the crops were fit for pulling by the end of March, whereas in a normal season May and June are the main harvesting months.

Variety Trial Results.—The samples at Oakwood were all small, and weighed light. A large number of cobs had been formed, but had been caught in an immature state by the hot, dry weather in the latter end of January. Early Yellow Dent topped the yields with 34 bushels 7 lb. per acre, and was followed in order by Riley's Favourite, Improved Yellow Dent, and Cornplanter. These varieties are all recommended for main crop sowing on the red and chocolate soils. African Standard and Hildreth's Yellow Dent were varieties new to the district. The former gave a promising yield, but the latter failed because it was not in cob when caught by the hot, dry weather. It is too late in maturing for the Inverell district. The Farmer's Variety was of the Mastodon type and did not yield very well.

Considering the bad season experienced, the yields obtained from the Inverell plots were very satisfactory. Funk's Yellow Dent gave the highest yield, namely 47 bushels 30 lb. per acre, and was followed in order by Riley's Favourite and Improved Yellow Dent. The Farmer's Variety, a large yellow maize, yielded fairly well. Of the two new varieties, Gold Standard Leaming gave a promising yield, while Hildreth's Yellow Dent proved to be too late in maturing and consequently gave the lowest yields in these plots.

Manurial Trial Results.—Table B shows the results obtained from the manurial trials. At Oakwood the manures forced a very vigorous growth and a fair number of suckers. The manured plots yielded from 4½ to 8 bushels per acre better than the unmanured plot because they were more forward and better in cob when caught by the hot dry weather. Reference to Table B will show that 1 cwt. of superphosphate per acre gave the best result. On the red and chocolate soils the application of from ½ to 1 cwt. of superphosphate per acre is recommended, the amount to be varied according to the quality of the soil. Such an application would only cost from 2s. 6d. to 5s. per acre.

The unmanured plot yielded better by 13½ bushels per acre than the manured plot at Inverell. The quantity of manure applied was excessive, and

produced a profuse stalk and leaf growth and suckers which rapidly used up the soil moisture, so that this plot suffered severely from the hot and dry weather in January and February. The manuring of the richer black and alluvial soils in this district is not recommended. Further tests will be conducted with much smaller quantities of manure. On the old black soil paddocks the application of ½ cwt of superphosphate per acre would probably give an increased yield.

Single grain v. hill sowing.—At Inverell an experiment was conducted in which the dropping of single grains every 15 inches was tested against two or three grains every 30 inches. The former plot yielded 34 bushels 53 lb. per acre, and the latter 47 bushels 30 lb., an increase of nearly 13 bushels per acre in favour of hill or bunch planting. Hill dropping is the usual method in this district and for black soils, at least, it must certainly be recommended in preference to single grain planting.

Acclimatised v. Introduced Seed.—An experiment in which introduced seed of Funk's Yellow Dent was tested against acclimatised seed of the same variety, was carried out on the Inverell plots. The introduced seed gave 44 bushels 52 lb. per acre and the acclimatised seed 47 bushels 30 lb. per acre. This is in keeping with the general experience. Maize introduced from a colder climate with a shorter growing season generally does well, while maize from a warmer climate with a longer growing season is at a disadvantage.

The Tenterfield Plots.

There were nine plots of two-fifths of an acre in each of the plots.

Soil.—In each case the soil was a greyish, sandy loam, of blue granite formation, friable, fairly deep, with a clay subsoil, and of medium fertility. The preceding crops at Tenterfield were potatoes, which had been manured, and cowpeas, the plots being sown evenly across both blocks. At Bryan's Gap, potatoes preceded the unmanured late-ploughed plot of Funk's Yellow Dent, and maize the unmanured early-ploughed plot of the same variety; the other plots were either preceded by no crop or by a stunted crop of cowpeas.

Cultural Details.—The land for the Tenterfield plots was well prepared, but a heavy storm on 10th October set the ground very much, necessitating re-cultivation. Finally the plots were sown on the 15th and 16th October in the shallow cultivator furrows, the seed being sown 3 inches deep, with single grains 15 inches apart, in rows 4 feet apart. Four varieties were sown with 1¾ cwt. of W2 per acre, and four extra plots of Funk's Yellow Dent were sown in the manurial trial, the manures applied being detailed in Table B. After sowing, the land was harrowed, and a heavy storm of over 2 inches on the night of sowing so set the ground that it had to be harrowed three times to break the crust.

At Bryan's Gap the unmanured early and late ploughed plots of Funk's Yellow Dent were sown on 16th October, and heavy rains then delayed sowing operations until 22nd October, the ground having to be again cultivated before sowing. The seed was sown 3 inches deep, with single grains

15 inches apart in rows 3 feet 9 inches apart. The variety and manurial trials were the same as in the Tenterfield plots, and in addition an unmanured plot of Funk's Yellow Dent was sown on late ploughed land.

Season.—The season was a very bad one. The rainfall between the ploughing and planting was : Tenterfield 347 points, Bryan's Gap 371 points, before the two plots were planted on 16th October, and 605 points before the remaining plots were planted on 22nd October. The effective rainfall after planting was: 1,365 points at Tenterfield (67 points in February ineffective), and at Bryan's Gap 1,452 and 1,218 points respectively for the two plots sown first and the remaining plots (59 points in February ineffective). In each case low rainfalls in August and September were followed by good rains in October, which ensured moist seed-beds for sowing. At Tenterfield the very heavy fall of rain on the night following sowing set the ground so much that, although it was harrowed three times to break the crust, a very poor germination was obtained. It was estimated there would only be three-fifths of a crop. At Bryan's Gap the two unmanured crops sown on 16th October did not germinate well, but the misses were re-sown to give them a better chance with the other plots, all of which germinated well. Both plots made an excellent growth throughout October, November and December, but the very hot and dry weather in January and February seriously reduced the yields. Many crops in the district proved total failures.

Variety Trial Results.—The results are given in Table A, from which it will be seen that Early Yellow Dent topped the yields at Tenterfield with 28 bushels 7 lb. per acre. This was to be expected, as it is a very early maturing variety. Reid's Yellow Dent, Funk's Yellow Dent and Leaming were next in the order named. These plots yielded better than was expected, the thin stand obtained just suiting the season.

At Bryan's Gap, Early Yellow Dent also topped the yields with 25 bushels 22 lb. per acre, with Funk's Yellow Dent in second place. Leaming and Reid's Yellow Dent gave very low yields. They did not cob well and suffered severely by the hot, dry weather in January. Early Yellow Dent and Funk's Yellow Dent are therefore recommended for main crop sowing in the Tenterfield district. From past experience Reid's Yellow Dent and Leaming can also be recommended for limited sowing.

Manurial Trial Results.—The results, which are shown in Table B, were inconclusive. The manured plots were from two to three weeks earlier than the unmanured plot, and made a more vigorous growth, which used up the moisture in the soil more rapidly, and as dry weather followed they were handicapped and yielded practically the same as the unmanured plot.

At Bryan's Gap the unmanured plot was at a slight disadvantage as compared with the manured plots, as explained under "Season," but by no means sufficient to account for the great disparity in yield compared with the manured plots. Superphosphate gave the best results, and 1 cwt. per acre gave nearly as good a yield as 2 cwt. The nitrogen in the complete manure forced a slightly more vigorous growth than the superphosphate alone, which was a disadvantage in such a bad season.

The conclusion formed from these and past experiments is that the application of from ¾ cwt. to 1 cwt. of superphosphate per acre is advisable and profitable on the average Tenterfield soils. It is only in occasional seasons, such as 1914–5, that increased returns are not obtained.

Early v. Late Ploughing.—The early ploughed plot yielded 14 bushels 54 lb. per acre. The late ploughed plot was mould-board ploughed 7 inches deep during the last week in September and was afterwards harrowed three times. It yielded 19 bushels 34 lb. per acre, the increase being attributed mainly to the fact that the preceding crop was potatoes, and the ground was in fairly good order through the winter, while maize preceded the early ploughed plot. The results are therefore not comparable. The early ploughed plot received very little rain in August and September, and good rains were not received until October, when the other plot had also been ploughed. The late ploughed plot was not set so much by the October rains, and a slightly better germination was obtained. Early ploughing is recommended and has been proved by previous years' results.

The Armidale Plots.

There were six plots, each ½ acre in area.

Soil.—The soil was a black, clay loam, of basaltic derivation. The previous crop was wheat for hay in 1913, followed by wheat for green feed, which was fed off by large stock in August, 1914.

Cultural Details.—The plots were drilled in on 27th October in rows 4 feet apart, with single grains 15 inches apart in the rows and 3 inches deep. Five varieties were sown, all without manure, and an extra plot of Early Yellow Dent was sown with 1¾ cwt. of W2 mixture. In January the plots were all suckered, except portion of the Boone County Special, which was left unsuckered for comparative purposes.

Season.—The rainfall between ploughing and planting was 275 points, and the effective rainfall after planting was 1,552 points (34 points in March were ineffective). There was practically no rain in September, but sufficient in October to ensure a moist seed-bed for planting and consequently a good germination. While young, the plots were thinned out considerably by caterpillars, which reduced the yields fully 10 per cent. Excellent rains in November and December gave the plots a good start, but hot dry weather in January, February and March considerably reduced the yield. The season was better than in the Inverell and Tenterfield districts.

Variety Trial Results.—Funk's Yellow Dent topped the yields with 41 bushels 5 lb. per acre, and the Farmers' Variety (Goldmine) was next in order of merit. Acclimatised seed gave this plot an advantage over the others. Funk's Yellow Dent and Early Yellow Dent will probably prove the best for this district.

Manurial Trial Result.—The manured plot yielded 10 bushels 23 lb. per acre more than the unmanured plot. Although one year's results can never be taken as final, it would be good practice for Armidale farmers to manure a

portion of their maize crops next season to determine on their own farms the advisability of manuring. On the poorer soils manuring is certainly advisable. For the present 1 cwt. per acre of a complete fertiliser, as was used last season on the plots, is recommended.

Suckering Experiment.—The portion of Boone County Special which was suckered yielded 30 bushels 41 lb. per acre, and that not suckered 29 bushels 28 lb., an increase in favour of suckering of 1 bushel 13 lb. per acre. The difference is not a great one and no definite conclusion can be drawn. In a dry season such as the last, suckering would be more likely to prove an advantage than in a wet season.

The Quirindi Plots.

These proved a failure on account of the bad season experienced. The plots were sown on 7th and 8th December and a good germination was obtained. A fair start was made in December, but dry weather in January and February, coupled with very hot winds, prevented the plots from ever reaching the tasselling stage. The crops in the district all failed. This district is too hot and dry for profitable maize culture. It is only in the better seasons that crops are obtained. Any varieties grown should be quick in maturing, Early Yellow Dent being preferred, although Funk's Yellow Dent and Reid's Yellow Dent have given satisfactory results.

General Conclusions.

Profitable maize culture is dependent on the maintenance of soil fertility by a proper rotation system, and manuring in accordance with the needs of the soil. A winter fallow to precede sowing is most important, and after cultivation should not be neglected. Suitable varieties should be used and so planted as to suit the climatic and soil conditions. Seed selection is important and is too often neglected by farmers.

Suitable rotations will vary in the different districts. At Inverell maize and wheat are generally grown in rotation, two crops of maize generally cleaning "oaty" ground sufficiently to enable another couple of wheat crops to be grown. In the Tenterfield district oats or wheat may be rotated with maize. Potatoes can also be used, but to a more limited extent. As the soils are light sandy loams, crops for green manuring should be grown where possible and ploughed under to increase the humus. Suitable crops are cowpeas after an oat or wheat crop, rape in the late summer and autumn, or field peas in the autumn and winter. The leguminous crops are preferable, as they also enrich the soil in nitrogen. In the Armidale district wheat and oats may be grown in rotation with maize.

Land intended for maize should be ploughed as early in the winter as possible, preferably in June, and to a depth of 6 inches or more. Afterwards such cultivation as is needed should be given to destroy weeds, conserve moisture and produce a good seed-bed. After-cultivation should be practised to keep the maize clean, and check evaporation of soil moisture. Once the plants have attained a fair size only shallow cultivation should be given, as deep working would injure the roots.

In the New England districts, the rows should be about 4 feet apart, and in the Inverell and Quirindi districts from 4 feet 6 inches to 5 feet. In New England, the usual method of planting is the single grain system, but on the richer soils and in the warmer districts, where suckering is more profuse, the hill or bunch system, where two or three grains are dropped at intervals of 27 to 30 or more inches, is the better one.

Seed selection is best practised in the field from the best yielding plants. More cobs should be pulled than are required, so that the worst may later be rejected, leaving a uniform sample. The rubbing off of undeveloped and uneven grains at tip and butt is advisable, both on account of a better yield being obtained and for obtaining a uniform sample for drilling.

TABLE A.—Showing Results of Variety Trials, 1914–15—Northern and North-Western Districts.

J. F. Chick, Tenterfield.		J. T. Cowin, Bryan's Gap.		J. T. Elliott, Armidale.	
Variety.	Yield per acre.	Variety	Yield per acre.	Variety.	Yield per acre.
	b. lb		b. lb.		b. lb.
Early Yellow Dent ...	28 7	Early Yellow Dent ...	25 22	Funk's Yellow Dent ...	41 5
Reid's Yellow Dent ...	23 1	Funk's Yellow Dent ...	18 51	Farmer's Variety ...	38 2
Funk's Yellow Dent ...	20 41	Leaming	10 48	Early Yellow Dent ...	37 1
Leaming...	19 5	Reid's Yellow Dent ...	7 6	Reid's Yellow Dent ...	34 7
				Boone County Special ...	30 41

Harding Bros., Oakwood.		J. Ditzell, Inverell.	
Variety.	Yield per acre.	Variety.	Yield per acre.
	b. lb.		b. lb.
Early Yellow Dent ...	34 7	Funk's Yellow Dent ...	47 30
Riley's Favourite	30 21	Riley's Favourite... ...	41 4
Improved Yellow Dent ...	28 28	Improved Yellow Dent ...	43 52
Cornplanter	25 42	Gold Standard Leaming ...	38 9
Boone County Special ...	23 42	Early Yellow Dent ...	38 8
Funk's Yellow Dent ...	23 14	Leaming	35 52
African Standard	22 42	Reid's Yellow Dent ...	34 48
Leaming	22 14	Farmer's Variety... ...	31 43
Reid's Yellow Dent ...	21 0	Cornplanter	29 26
Farmer's Variety	18 0	Boone County Special ...	28 47
Hildreth's Yellow Dent ...	...	Hildreth's Yellow Dent ..	28

TABLE B.—Showing Results of Manurial Trials, 1914–15—Northern and North-western Districts.

Plot.	Variety.	Unmanured.	1 cwt. Superphosphate per acre.	2 cwt. Superphosphate per acre.	P5, 1¼ cwt. per acre.	W2, 1¾ cwt. per acre.
		bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Oakwood ...	Reid's Y.D.	14 0	22 7	21 0	19 14	18 28
Inverell ...	Funk's Y.D.	47 30	....	....	....	34 0
Tenterfield ...	Funk's Y.D.	19 42	19 52	19 31	19 6	20 41
Bryan's Gap ...	Funk's Y.D.	14 54	29 49	31 7	25 49	18 51
Armidale ...	Early Y.D.	37 1	....	....	....	47 24

DISEASES OF WHEAT.—FARMERS' BULLETIN, NO. 102.

As remarked in a brief review of Bulletin No. 101, "Wheat Culture," the references to insect pests and fungus diseases of wheat could not be included in that publication, and a separate issue had therefore to be made. Copies of this are now available to farmers on application to the Under Secretary and Director of Agriculture, Sydney.

In the nature of things, it is the fungus diseases that occupy the greater number of these forty pages, for the smuts, rusts, and mildew are the most serious enemies of the grower. For years, indeed, plant-breeders inside and outside the Department have tried to produce new varieties that would resist the attacks of smuts and rusts in particular, but with only modified success. Fortunately rust is somewhat intermittent in its attacks in the regular grain districts, and it has been found that in districts where it is most likely to occur it may be combated by growing varieties that mature their crops (whether grain or hay) so quickly that they are ready to harvest before the fungus has had time to do appreciable harm.

With the smuts, especially stinking smut or bunt, the case has been different. It is ever and everywhere present, and any resistant varieties that have been produced as the result of cross-breeding have generally proved very poor croppers. We are thrown back, therefore, upon the pickling process that is now known and practised by every progressive man. The formalin treatment, once much thought of, is mentioned briefly but sufficiently to indicate why it has had to be abandoned in favour of bluestone and lime. Other fungus diseases are not forgotten in the attention given to the two referred to.

A valuable summary of the work of the Department's officers, on white grubs, wire-worms, cut-worms, Rutherglen bug, grasshoppers, grain weevil, &c., make up the section devoted to insects.

The illustrations are quite up to the standard of previous works of the kind, and will be found particularly helpful in indicating the reasons for the various methods of prevention or control.

Teff Grass.

The following report concerning Teff grass has been received from the Experimentalist, Hawkesbury Agricultural College:—

A plot of this annual grass was sown on 25th November, 1914. The seed germinated well, and, helped by a good season, soon made rapid growth.

After reaching a height of about 2 feet 6 inches there was a good deal of lodging, due probably to the long thinnish stalks not being able to bear the weight of the rain and wind.

After flowering, a portion of the plot was cut for hay, but was spoilt by rain, nevertheless a load was taken to the cattle paddock, where a fair amount was eaten.

One advantage of the Teff is, that it grows rapidly, and does not occupy the land for a very long period. Sown thinly it should be freer from lodging, and ought to be useful as a hay crop, providing it is nutritious enough. During its early growth it is a soft succulent grass.

The soil on which it was sown varied from sandy to red loam, and the growth was about the same on each. It should do well on any soil.

In appearance Teff somewhat resembles other grasses of the *Eragrostis* family. If anything the stems and leaves are slightly broader, thicker, and more succulent than other varieties growing on the farm. Although it was impossible to save seed, owing to the lodging, the Teff appears to be a good seeder, judging by the quantity that germinated after the plot was cleaned.

Teff was, for the second time, sown at the College owing to an increased interest taken in this grass, as noticed from reports received from Queensland, and comments in the press generally.

These reports show that the grass grows vigorously in light as well as medium soils. Its annual character renders it unsuitable as a pasture grass. It possesses two virtues, however, which justifies its recommendation for cultivation under favourable conditions.

(1) It is a very quick-growing grass, and, owing to the rapid germination of the seed, is very successful in combating weed growth. Even Couch grass is kept under by Teff.

(2) It can be recommended as a catch crop between the harvesting of a winter fodder crop, such as wheat, and the sowing of another following winter crop, such as oats.

In spite of these advantages, however, it cannot be expected to replace sorghum or maize as a summer crop on suitable soils. But on poor soils too light for these crops Teff could be grown to advantage.

The grass was also tried last year at Grafton and Cowra Experiment Farms with very unsatisfactory results. At Grafton its growth cannot be compared with such vigorous plants as Paspalum, Rhodes, Guinea or Para grass, while at Cowra it suffered so severely from the hot and dry summer conditions that any promise of it in this district seems very unlikely.—E. Breakwell, B.A., B.Sc., Agrostologist.

Field Selection v. Barn Selection of Seed Maize.

H. WENHOLZ, B.Sc. (Agr.), Assistant Plant Breeder.

AN opportunity was afforded last season of making a test of ears which had been selected in the field against those which had been selected from the barn. The variety used was Leaming, and the barn-selected ears were, if anything, better in appearance and size than the former. All the ears used were the best obtainable, for they were selected as foundation ears for the Stud Plot in the ear-to-row system of breeding. The reason why so many barn-selected ears were taken was that they were mostly of better type than the field-selected ears, for it is easier to find such good type ears amongst a pile in the barn, and it was felt that they should be included in the ear-to-row test as foundation ears because of their good type.

A study of the following table will show the superiority of the barn-selected ears before planting:—

FIELD SELECTED.			BARN SELECTED.		
Ear Number	Length of Ear.	Weight of Ear	Ear Number.	Length of Ear	Weight of Ear.
	inches.	oz		inches.	oz
15	9¼	13	46	7¾	10⅞
23	8½	11¼	57	9½	13¼
7	8¾	14	44	8	10¾
6	8	11½	39	9	12½
8	9	11⅝	42	8¼	11⅛
31	8	10¼	43	8	10⅞
24	8¾	11¼	55	8¾	10⅛
20	8¾	11¾	56	9	12
11	8	9½	1	8½	11¼
9	8	9	50	9¼	11⅞
10	7¾	10½	34	9¼	10¾
17	7¾	10½	36	8½	11⅜
12	7¾	10½	3	9	11½
19	9	13	51	9¼	10¾
29	7¾	10½	32	9½	10¾
27	7½	11	2	8¾	11⅛
			35	8½	11¾
			47	8½	11⅛
			38	8¼	12⅝
			33	9½	12⅛
Average...	8·28	11·19	Average ..	8·87	11·42

It will be seen that the barn-selected ears averaged over half an inch in length more than the field-selected ears, and their superiority in this direction may also be seen from the fact that amongst the latter there were only three ears which were 9 inches or over in length, while amongst the former there were eight ears; also the latter contained nine ears with a length of 8 inches or under while the former contained only two ears in this class.

The weight of the barn-selected ears averaged about ¼ oz. more than the average weight of the field-selected ears, and there were only five ears of the latter over 11½ oz. in weight as against seven of the former, and seven ears of the latter 10½ oz. or under in weight, as against only one of the former.

It will be seen, therefore, that the barn-selected ears possessed a distinct advantage over the field-selected ears, as regards hand and eye judgment of the ears alone.

In spite of this advantage, however, the field-selected ears gave an average of 52·1 bushels per acre, while the barn-selected ears averaged 45·5 bushels, showing an increase in favour of field-selection of 6·6 bushels per acre, or 14·5 per cent.

This is a consideration when the increased cost of field-selection is practically insignificant, and is reduced to a minimum by attaching a small box to the harvesting dray into which the field-selected ears are thrown.

As a guide to the points to be observed in field selection, the following summary may be useful. (For fuller information, see the *Agricultural Gazette* for September, 1914):—

(1) Avoid ears from plants which have a large amount of free space around them, unless such ears are considerably above the average, and select from those plants which produce a good ear under normal or adverse conditions.

(2) On rich ground maize suckers freely, and it is impossible to select all ears from suckerless stalks. The results obtained so far seem to indicate that a plant possessing a good ear in a normal stand may be selected whether it has suckers or not, but it has been found that, if the suckers also bear ears in a normal stand, the plant is usually a good one to select from.

(3) No advantage has yet been obtained from selecting for two or more ears per stalk unless the first ear is up to the standard. It does not seem advisable to select for two or more small ears instead of one large one.

(4) Ears too high on the stalk in tall-growing varieties should be avoided, and in short-growing varieties the ear should not be allowed to get too close to the ground.

(5) Ears showing insufficient protection of the husk over their tip should be studiously avoided; especially is this an important factor on the North Coast where the weevil infests the crop in the field.

(6) Short-shanked ears should always be avoided, and the shank should neither be too thin nor excessively thick.

(7) Ears drooping at maturity are not only resistant to the weather, but have been found in most instances to yield much better than ears erect at maturity.

(8) The stalk should be thick at the base, and should not taper too rapidly up to the ear.

It will be seen how easily the observance of such points in selection may increase the yield, and how it is impossible to consider such points when selecting seed ears from the barn.

How to obtain Pure Strains of Pumpkin Seed.

C. T. MUSSON, Hawkesbury Agricultural College.

The Present Position.

ENQUIRIES have been lately made as to how a grower may obtain pumpkin seed likely to give satisfactory results. For example, it seems difficult to obtain seed of the well-known Ironbark pumpkin that will give an even crop of Ironbarks, whilst such a thing as specially selected or pedigree seed is unobtainable.

This would appear to be on account of the fact that sufficient attention has not been given to the matter, seed being saved from fruits resembling the type grown without special care being exercised to prevent contamination. As a consequence, seed often results in fruits very varied in character or differing markedly from the expected kind, the plan usually followed being to save seed from fruits that resemble the type required, taking the largest fruits for the purpose.

Treated in this way, even with a certain amount of care being given to the process, pumpkins will always tend to vary a good deal in their fruits, for the seeds used are often the result of crossing, which will encourage variation. The main reason for this crossing lies in the fact that it is usual to grow several varieties in close proximity, often not even separated by an area of some other crop. Bees visit the flowers, and in doing so may carry pollen (the male fertilising agent) to the fruiting flowers of other varieties; wind may also act as the carrier. The inevitable result is that fruits do not come true when the new seeds are sown, though we may see no change in the fruit which is the immediate result of the cross.

In addition to this crossing between two varieties, there may be crossing between two species; this is, properly speaking, a hybrid. There would then be even greater variation in the results exhibited after the seeds formed by hybridisation are sown. Cases of hybrids are not by any means so common as plain crosses between varieties.

These "rogue" variations in the shape, colour, and character of the fruit usually come from growing different forms close together.

If we want to keep any plant strain pure, provided it is a kind in which the fertilising agent must come from a different flower (insects and wind being the usual means), it is necessary to grow the crop in such a position that it does not give the opportunity for contamination, either by bees or wind bringing pollen from related plants, either varieties or perhaps species. Hence the great importance of isolation when growing plants for seed.

It must be remembered, however, that crossing between different plants of any one variety is necessary, otherwise we do not get the best return in fruit and seed.

Another Factor—The Age of the Seed.

Apart from the question as to whether seed is true to type and of good germinable quality, in the growing of pumpkin, melon, squash, or any other cucurbitaceous plant, another matter of some importance is that of the age of the seed.

There is a common belief amongst growers that, to get the best results, new seed should not be used; it should be two or three years old.

Concerning this, Troop writes in "Melon Culture":—"It is said by successful melon growers that the best results are usually obtained from seeds which are 2 or 3 years old, providing, of course, they have been properly handled. The fresh seeds will often produce the greatest degree of luxuriance of plant and foliage, but the fruiting qualities come with age."

C. L. Allen, Specialist in Long Island, U.S.A., says:—"Gardeners with keen observation note the fact that the older melon, cucumber, and squash seeds are, without having lost their germinating power, the better, as the proportion of flesh to seed is greater, and the vines are more productive of fruit and less inclined to throw out branches."

L. H. Bailey, in "Plant Breeding," says:—"Lessened vigor, so long as the plant continues to be healthy, nearly always results in a comparative increase of fruits or reproductive organs. It is an old horticultural maxim that checking growth induces fruitfulness."

The tendency is for seeds to become weaker in vegetative power as they age; plants grown from fresh seed tend towards a more robust growth than will be the case where older seed is used.

We can only recall one actual case where trial was made between new and old pumpkin seed, in which case the plants grown from new seed gave the largest and strongest plants; those from old seed came later, gave weaker plants, but returned much the largest yield in fruit. In this trial the strong barren plants were nipped back, when laterals developed carrying a much better supply of fruiting flowers.

Reviewing all these statements, it appears to be a fact that, in the case of pumpkins and related plants, seed of two or three years old is preferred to new. There seems, however, to be room for investigation into the matter—

First—Whether old seed is really better than new, and at what age of seed we get the best result.

Second—Can strong plants be diverted from comparative barrenness into a better fruiting condition by pruning or any other method, and how this is best done.

With regard to the latter point there is a certain amount of evidence to show that if the original stems grow vigorously and unchecked, they tend to throw mainly male (pollen-bearing) flowers; but if the ends are pinched off, when young, retaining four or five leaves, lateral branches will come away, on which the proportion of fruiting (female) flowers is much greater.

This seems to bear out the statement that strong vines may tend to barrenness; whilst with weaker plants, or on the establishment of a check in growth, we get more fruiting flowers, and consequently a much better return in fruit.

How to obtain a Pure Strain of Seed.

A plan for getting a pure strain of seed of, say, the Ironbark table pumpkin, is outlined below:—

First Season.

Obtain seed of the Ironbark pumpkin from a seedsman or elsewhere, and grow a crop.

It should be put in quite away from other pumpkins, squashes, cucumbers, melons, and other related plants, in order to try and prevent liability to crossing. Indeed, it would be well, when entering upon pumpkin-growing for seed, to have no other pumpkins or related plants on the place. Care should also be taken not to plant near any such things growing on a neighbouring place.

(If we are sure of the parentage of our seed first planted, we can cross a few plants under the same conditions and circumstances as explained in the proceedings for the second season's growing.)

When the fruits are ripening, note the different plants carefully, and mark such as reproduce the characters of the Ironbark variety. Save the *fruits of the best plants* for seed (not the best fruits only), noting vigour, freedom from disease, fruiting character and capacity, size, &c. Seeds are likely to reproduce the characteristics of the plant rather than of the fruits.

Plants departing from the characters of the Ironbark need not at this stage be destroyed, as their fruit would be marketable. But if such occur, and they could be distinguished whilst young and before the flowers open, it would be an advantage to destroy them, as that would prevent the possibility of their crossing with the plants we desire to save.

Out of the fruits saved, take those only for seed from the best selected plants, and keep the seeds of each plant separate so that they may, later, be sown separately. This will enable the operator to follow up single plant selection—a most important matter—as individual plants have their own special characteristics, differing somewhat from all others; and we may find just what we want in the product of some one plant, which will reproduce its like, providing the seeds are the result of fertilisation by pollen from a plant resembling itself.

At this stage we have to trust that the fruits are the result of proper fertilisation and have not been crossed undesirably.

In selecting for seed saving, after due attention has been paid to the plant, in the fruits we should look for good average size. Table pumpkins should not to be too large, perhaps 10 to 15 lb.; they should be flattish in shape, with no lumpy excrescences; they should have thick, fine-grained flesh, with not too much waste—that is, the proportion of flesh to seed cavity should

be high*; they should be in good general condition, and quite free from disease. All these factors tend to keeping-quality a most important matter in a good table pumpkin.

In saving the seeds, they may be washed in water with advantage, to remove any pulpy matter and floating seeds, which are light and probably either immature or infertile. Washed seed should be thoroughly dried by spreading it on bags or a tarpaulin.

These proceedings take up a whole season, but all fruit will be of use, either for marketing or for home purposes, even after the seeds have been removed. Nothing need be wasted. All seed saved from suitable plants not hand crossed will be "selected seed," likely to result in a good type of Ironbark pumpkin if free from contamination by other varieties during the flowering period. We can call this result of the first season's work, selected seed. At this stage, however, and until we have proved our fruits through two or three crops, we cannot be quite sure that the seed is pure enough to produce an even Ironbark crop.

For until the fruits appear we cannot judge our pumpkins, and therefore cannot tell whether the seed we started with was Ironbark; nor can we be certain as to the first crop being free from undesirable inoculation. If the fruits from which we obtained the seeds first used were actually seen so as to assure us they were of Ironbark type, it is a great help, as once we are sure of our position we can proceed with greater certainty. What we are aiming at starting with is seed obtained from an Ironbark pumpkin, the original flower of which was fertilised by pollen from another Ironbark plant.

(Any seed saved from plants hand-crossed should be specially dealt with; we can call it ×-seed.)

Second Season.

Of the selected seed saved from selected plants of the first season, enough should be laid aside, carefully protected from likely damage by insects, animals, or damp, for use in the third season as two-year-old seed. The balance should be planted in the ordinary way, if under rotation so much the better, and certainly in some location well away from all other pumpkins or related plants. The seeds should be planted so as to enable the grower to follow up the plan of single plant selection commenced with the first crop.

(We may also be able to plant some ×-seed from plants crossed in the first season.)

The resulting plants and fruits may be presumed to be of true Ironbark type, if we were fortunate enough to start originally with seed of that type and to have prevented all fertilisation except Ironbark × Ironbark. If we should find any fruits not of the type wanted, we should proceed as advised for the operations of the first season, selecting for seed purposes suitable fruits on good healthy plants. This second season's crop is, however, to be specially treated, in order to try and fix a strain of pure Ironbarks.

* Old seed is said to be most likely to give this result—a fact that should specially be borne in mind when growing for size, as in cattle pumpkins.

We shall proceed in two ways, as follows :—

First Method.—The bulk of the crop from selected seed will be treated exactly as in the case of the first season's crop. Selected fruits are saved for seed in such quantity as may be desired or possible.

Great care must be taken to see that nothing but what appears to be of the best quality Ironbark type are saved for the purpose (unless it should happen that we see something good or new in our crop, and therefore worth taking in hand.)

Such as are saved for selected breeding should be again (and always) saved on the basis of plant selection rather than fruit selection, as already explained.

Again, all plants not apparently of the Ironbark type can be dealt with for marketing purposes (or destroyed when young, if observed in time; it is, however, difficult to separate the varieties before the fruits develop).

The saved selected seed from this "first method" will be of the same type as that of the first season, but being the second season's selection, will be more likely to give even results on sowing. This could be marketed as specially selected seed, and should be worth a little more than the first season's product. Provided it is the product of pure seed, without undesirable crossing the first season, and provided also that in its second season's growth it was not crossed undesirably, it should give very few, if any, rogues in its resulting crop.

Again, some of the selected seed is stored until two or three years old, the grower judging the quantities to be saved or marketed, according to circumstances; though it would appear well to arrange that after this second season, the bulk of the seed marketed should be two years old.

In future crops it would be possible to carry on trials of old *v.* new seed, and so prove the truth or otherwise of the statements as to the greater value of old seed for crop purposes, and whether one-year seed, with the plants pinched back, would be sufficiently good to secure a satisfactory crop. Positive information on this matter would also enable the grower to adapt his own proceedings to the use of seed the age of which he has proved to give the best returns.

Of course, all this means work, and the keeping of careful records; but it should be well worth the trouble.

We must, above all things, be careful to remember all the time, if we want pure seed, the necessity for keeping our plants free from possible contamination by other cucurbits; otherwise they will be liable to give us various types of fruits, and we should have to begin the whole thing over again. We must give our Ironbarks every chance to remain true to type.

(Any plants raised from crossed seed of the first season's growing will be selected from also; the seed to be carefully saved for future use.)

Second Method.—This is for the purpose of making sure we start our breeding operations with seed that is the result of Ironbark fertilising Ironbark, in which case only are we sure of it being true to type.

We could commence this process, as has already been suggested, with some flowers of the first crop, if we are sure the plants come from seed that was pure Ironbark; there being always some uncertainty as to this; possibly we shall do so.

If we should commence crossing the first season, and results prove that we started with pure material, we should save a year in time. Under any circumstances we should proceed with the process in the second season, as described below, with material that has been under observation, and is, therefore, tolerably sure to be of purity suitable for our purpose.

We isolate certain selected suitable plants (grown from the first season's selected seed), and treat the flowers in a special way for the purpose of securing pure seed, by controlling the pollen and the fruiting parents; calling the result x-seed.

Before describing the process, something must be said about the flowers, so that their structure and the necessary working details may be understood.

Fig. 1.—Fruiting flower of pumpkin on the left; Pollen flower, with long stalk, on the right.

Pumpkin fruits are produced by short-stalked flowers (female), most commonly found on the basal half of a branch; there is a swelling just below the flower which eventually becomes the fruit.

The pollen-bearing flowers (male) have longer stalks, are produced all along the branches, and fall off as soon as the pollen grains have been discharged. These grains act as the fertilising agent in the production of fertile seed, and one grain is required for each seed produced.

The accompanying illustrations show the two kinds of flowers (Fig. 1) as growing on the plant, and (Fig. 2), with part of the protective bodies (corolla, &c.) cut away to show the interior.

It will be seen that the parts essential to reproduction are developed in different flowers but on the same plant, consequently some outside agency must convey pollen grains to the fruiting flower at the right time; a proceeding

absolutely necessary in order that seeds may be fertilised and thus become fertile, and the fruits made to grow. Moreover the pollen grains must come from a different plant, in order to successfully fertilise any fruiting flower. Of course, both parent plants must be of the same variety. The special process we are to carry out will be as follows:—First select a dozen or twenty plants that look healthy and well grown. As soon as the female flowers are seen and before they open, cover with a paper bag, say, four or five on each plant, by tying it round the butt of the flower stalk with string, but muslin would do equally well. This is to prevent insects from bringing pollen to the flowers. Bees commonly do the carrying, wind also helps, but we want to select pollen from certain plants for the purpose, and thus control the parents.

If paper bags are used they should be reasonably strong, without being too stiff, so that they may be easily tied on to fit well round the stalk. They should be of such a nature as to be able to resist rain or dew for a few

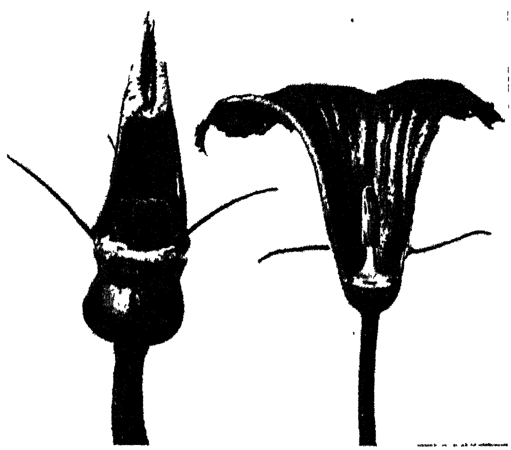


Fig. 2. Fruiting flower of pumpkin on the left; Pollen flower on the right (front of flowers cut away to show the interior).

days, and not collapse too readily. Bags 6 inches long by 4½ inches wide, when flat, made of paper such as is used by grocers for parcelling up sugar would be suitable. (A good type of paper is called grey royal hand.)

Examine some fruiting flowers in the early morning; as soon as they open and the top of the central column shows a shiny appearance, the protected flowers are ready.

Then obtain from selected but different plants, some ripe pollen-bearing (male) flowers. Cut away the parts surrounding the central pollen-bearing column, and make sure that the pollen grains are being discharged; using this as a sort of brush, the stalk acting as a handle, bring the top of the pollen bearing part in contact with the top of the column of the fruiting flowers, from which the protective bag must be taken for the purpose.

Gently move it about in order to place as many pollen grains as possible on the top of the fruiting column, as a separate grain is needed for each seed formed.

This process is to be repeated for as many fruiting flowers as it may be desired to cross, using a fresh pollen flower for each fruiting flower. Care must be taken that the two flowers used in each operation do not grow on the same plant, or the process will come to nothing; for, in general, pollen of any plant will not be of any use in fertilising a fruiting flower on the same plant. To get the best results we need to have two individuals of the same variety used in the process. Any selected plant may, however, be used, either as a pollen-bearing or a fruiting parent, with any other similar plants.

Each fruiting flower, after being treated with pollen, should be bagged up again and marked, either with a numbered stick or a loosely-tied label. Whatever system of marking is used it should be able to withstand the weather. It will be most important for the grower to be able to identify each fruit, as to its parentage when harvesting.

In the course of ten to fourteen days the bags could be finally removed. It need hardly be said that careful records should be kept of all that is done for future reference, and in order to keep clear all details as to operations carried out, and the results obtained.

The seed from each plant should be kept separate in order to keep up the general plan of single plant selection.

Seed we ought to get this season will be—

(1) selected seed, from fruits growing on good selected Ironbark plants, grown from selected seed saved the previous season. Some of this should be kept for home sowing next season, some until two years old, the balance being for sale.

(2) ×-seed, from plants hand-crossed this season. Some will be made use of for next season's crop; some should be carefully stored away to be used as two-year-old seed.

If we crossed any plants the first season we should now be able to save some seed from fruits grown from ×-seed of the first season's growing, under the same precautions as in the other cases.

Third Season.

If enough ×-seed from plants crossed the second season has been raised for our home sowing, we need only put in small plots of selected seed one year old and selected seed two years old for comparison and trial as to best age at which to use seed. There may be some ×-seed descended from plants crossed the first season; if so we should plant it, and trace results through as with others.

The ×-seed, saved from specially crossed pumpkins grown in the second season, should be tested for germination value before trusting to it for the bulk crop to be grown this third season. If it proves good, and we have

plenty for our purpose, we should use it, otherwise selected seed must be used to the required extent. It would be well to test all seed to be used or sold.*

This third-season's crop should be grown with the same careful attention as in previous years. Again especially is it necessary to prevent any crossing from undesirable related plants, so the crop should be again isolated, as should always be the case if growing for seed. No other cucurbits should be grown; our labour may be in vain if we get a mixture of types.

There should be no need to proceed with the hand-crossing; but it might be well to again cross a few desirable plants, and follow up the process in the same way as described for the second-season's crop. When the respective crops mature, fruits are saved under the same special methods of selection as before described, noting especially plant characteristics.

Again some selected seed will be saved, whilst the ×-seed may be considered to be pedigree seed, and could be sold as such. It will be of more value than selected seed, as more certain to produce an even crop of typical Ironbarks.

Arrangements should be made to store some of this seed also for use as two-year old seed.

Fourth and later Seasons.

Each succeeding year the seed is more likely to give even results as to type of fruit; the quantities being more permanently fixed, if the crop is kept pure during the flowering period.

The process should be continued, keeping up the careful selection. Probably as the result of the third-season's crop, the basis will be laid for a continuous growing of the type of pumpkin required; but each year careful attention must be given to the detail matters already referred to, if purity and quality are to be retained. If the general plan outlined be followed there should be no difficulty in the matter of keeping the plants up to type; but any slackening off in the necessary care and attention will lead to a drop back to varied types, with consequent loss of time and disappointment.

Summary.

If this seed-raising plan be taken up on the basis of using some single variety of pumpkin, and the necessary continuous work be given to it, there should be no doubt as to success being achieved.

One great advantage would be in the fact that whatever fruits developed whilst purifying the stock, there would be no loss of crop, for all fruits are useful, whilst from the first crop some seed would be saved. Each succeeding year the quantity of seed saved could be increased, consistent with the success of crop and the requirements of the market.

From the third crop onwards the grower ought to be in a position to market sound pedigree seed, which should be worth considerably more than ordinary selected seed. He should also have been able to demonstrate the

* See Farmers' Bulletin, 73. Seeds and Seed Testing for Farmers.

age at which seed is best used: consequently he will be in the position to use such for his own crops. The grower should note that crosses between stock of the same variety grown apart from one another are usually more vigorous than crosses between plants grown side by side for some time: the benefit is to be seen in increased vigour and yield. It would answer the purpose, therefore, to bring in from other crops of Ironbark pumpkins male flowers with which to fertilise some fruiting flowers in our own crop. Change of seed is also useful, as giving more vigorous and often more fruitful plants. This points to the necessity for continuous operations in breeding required seed, and periodical changes of stock in order to keep up the strength of the race.

If we commence operations by trying to get two distinct forms (species) to hybridise, the process would be much more difficult, as species do not easily fertilise one another. If such an attempt proved successful, the resulting seeds might give very varied types of fruit. In case of only one plant developing from such seed, it would most likely produce infertile seed or none at all. Many factors contribute to make such hybridising between species difficult and usually unsuccessful, such as impotent pollen, unsuitability of parents, weather conditions, and imperfect operations. If it is, however, desired to try such an experiment, a good number of flowers should be operated on in order to give as many chances of success as possible.

The proceedings as written out may be somewhat hard to follow; it has been thought well, therefore, to give in sequence a short summary of the processes a grower would go through in producing a good type of seed leaving all details to be looked up as required.

Epitome of Proceedings for Four Seasons.

First Season.

Sowing.—(September).

1. Plant some seed.
2. In early flowering time cross a few flowers.

Harvest.—(April-June).

3. Save the seed from selected plants grown from No. 1. Selected seed.
4. Keep some of this No. 3 seed stored for use when 2 years old.
5. Save seed from crossed flowers No. 2 = × -seed.
6. Store some of it for use as 2-year old × -seed.

Second Season.

Sowing.—(September).

7. Plant selected seed No. 3.
8. Plant × -seed No. 5.
9. In early flowering time cross some flowers of No. 7.

Harvest.—(April-June).

10. Save selected seed from No. 7.
11. Keep some selected seed No. 10 for use next season.
12. Store some selected seed No. 10 for use when 2 years old.
13. Save × -seed from No. 8.
14. Keep some × -seed No 13, for use next season.
15. Store some × -seed No. 13, for use when 2 years old.
16. Save × -seed from crossed flowers, No. 9.
17. Keep some × -seed No. 16, for use next season.
18. Store some × -seed No. 16, for use when 2 years old.

Third Season.

Sowing.—(September).

19. Plant 1-year old selected seed, No. 10.
20. Plant 2-year old selected seed, No. 4.
21. Plant 1-year old ×-seed, No. 13.
22. Plant 2-year old ×-seed, No. 6.
23. Plant 1-year old ×-seed, No. 17.

Harvest.—(April-June).

We ought to be able to judge now which type of seed is the best for use in the fourth year:—

1-year old selected seed. 1-year old ×-seed.
2 " " 2 " "

And should harvest and store accordingly.

Our experience should now guide us as to which to breed and use in future. We should, therefore, be able to deal with the third season's harvest on practical lines.

When planting for the fourth season we shall need to put in some No. 18 2-year-old seed from crossed plants. These may be expected to give the best seed for working from in future. Results of the fourth year's work should be quite sufficient to fix such a strain of seed as is required. The work would then be much simplified, as arrangements could probably be made to carry on with one type and age of seed. The only thing then needful would be to keep up the purity and periodically strengthen the strain by crossing with some pure strain growing at a distance.

Points for Pig-raisers.

The following results of experiments in feeding pigs carried out by the Irish Department of Agriculture may possibly be of value to Australian readers. It was found that:—

1. It takes less food to fatten a pig in summer than in winter.
2. Barley, pollard, and maize are of about equal value in the production of live weight, but barley gives the finer quality of bacon.
3. It takes 5 cwt. of meal to make 1 cwt. of pork.
4. One gallon of separated milk is about equal to 2 lb. of maize meal.
5. A ton of potatoes in a mixed ration will produce 1 cwt. of pork.
6. Weight increases more rapidly in the early stages of fattening than in the later with the same rations.
7. Raw meal, steeped in cold water for periods up to twelve hours gives greater gains than cooked meal, while the quality of the pork is equally good.

Pure Berkshire Boars and Sows for Sale.

Young Boars and Sows by "Hawkesbury Augustus" (imp.) from selected Sows by "Yarra" and "Manor Captain" are for sale at the Yanco Experiment Farm. Applications should be made to the Manager.

Farmers' Experiment Plots.

Potato Experiments, 1914–15.

A. J. PINN, Inspector of Agriculture.

[Owing to the heavy winter rainfall the harvesting of several of the plots was delayed, and the returns were not available for earlier publication with the other results.]

Millthorpe.

The experiments were conducted on Messrs. Noonan Bros.' farm, and consisted of a variety, manurial, and a rotation experiment.

In the variety and manurial trials a crop of rape was grown, and ploughed under in August as green manure. The land (a red basaltic loam) was again deeply ploughed in October. Another ploughing was given in November with a three-furrow plough, and the potatoes planted by hand every third furrow. The same treatment as regards ploughing and planting was given the rotation experiment.

The germination of all plots was excellent, and during the early months of growth the crop gave every promise. The weather conditions up to January were all that could be wished, as during the previous three months practically 12 inches of rain fell. Hot winds then made their presence felt, and as no rainfall of any consequence fell, the crop suffered severely on account of the demands of moisture made by the heavy top growth. On 20th February, 170 points of rain fell during a storm. This caused partial flooding, and with the following hot, dry weather, the surface cracked, and as the grub of the potato moth was prevalent, infection of the tubers soon followed.

The droughty condition continued, in conjunction with the attack of the potato moth, until 30th March, when satisfactory rain was recorded. The crop was then too far advanced to be benefited; nevertheless, had it not been for the ravages of the moth, a fair yield would have been obtained.

It was observed, at digging, that practically all the surface tubers had been totally destroyed, and the early-maturing varieties, such as Manhattan, Satisfaction, Early Manistee, and Carman, suffered somewhat more than the others from the attack of the grubs.

The unsatisfactory character of the season, as a whole, coupled with the ravages of the potato moth, render it quite impossible to draw any definite conclusions from the results of the manurial and rotation experiments.

The following were the yields:—

Variety Trial.

Manured with P4 mixture at the rate of 3 cwt. per acre.

Variety.	Yield per Acre.			
	t.	c.	q.	lb.
Coronation	3	4	2	21
Burbank	2	11	3	18
Premier	2	9	0	2
Early Manistee	2	2	0	5
Manhattan	2	1	3	27
Carman, No. 1	1	19	0	19
Surprise	1	14	3	25
Queen of the Valley	1	14	3	17
Satisfaction	1	5	2	8

Manurial Trial.—Variety: Surprise.

Manure and Amount.	Yield per Acre.			
	t.	c.	q.	lb.
P4 mixture, 3 cwt. per acre	1	14	3	25
Superphosphate, 2 cwt. per acre	1	11	0	18
No manure	1	10	0	3
P5 mixture, 2½ cwt. per acre	1	7	1	20
Superphosphate, 4 cwt. per acre	1	4	0	2

Rotation Experiment.—Variety: Manhattan.

Previous Crop.	Manure and Amount per Acre.	Yield per Acre.			
		t.	c.	q.	lb.
Field Peas	P5 mixture, 2½ cwt.	2	2	3	20
,, ,, ...	No manure...	2	7	0	21
,, ,, ...	P4 mixture, 3 cwt.	2	1	0	12
Rape	P5 mixture, 2½ cwt.	2	5	2	1
,, ...	No manure...	2	7	2	20
,, ...	P4 mixture, 3 cwt.	2	7	3	20
Fallow	P5 mixture, 2½ cwt.	1	14	3	25
,, ...	No manure...	1	17	2	7
,, ...	P4 mixture, 3 cwt.	2	6	3	20

Crookwell.

The experiment was carried out on the farm of Mr. A. Boys, "Strathroy," Crookwell, on a red loam of basaltic origin. The land was fallowed in August, and again ploughed previous to planting, which was done by machine, commencing 20th November.

As in other districts the early season was good, but from the 8th of January onward there were forty-three days of hot winds, followed by 154 points of rain, and another hot, dry spell for thirty-eight days. During both the droughty periods the grub of the potato moth did extensive damage, and continued to do so throughout the six weeks of dry weather in April and May. As was expected, under such circumstances, the yields were low.

Variety Trial.

Manured with P1 mixture at the rate of 3 cwt. per acre.

Variety.	Yield per Acre.			
	t.	c.	q.	lb.
Satisfaction	1	17	1	1
Queen of the Valley	1	17	0	6
Manhattan	1	13	2	6
Early Manistee	1	13	1	13
Carman, No. 1	1	11	2	12
Coronation	1	11	2	9
Premier	1	10	1	9
Surprise	1	2	2	12
Brown's River	0	16	1	13

Manurial Trial.—Variety : Surprise.

Manure.	Quantity per Acre.	Yield per Acre.			
	cwt.	t.	c.	q.	lb.
Superphosphate	2	1	5	0	14
P4 mixture	3	1	2	2	12
Superphosphate	4	0	18	1	2
P5 mixture	$2\frac{1}{2}$	0	17	0	7
No manure	......	0	11	0	3

Seventh Annual Conference of Poultry-farmers.—Farmers' Bulletin, No. 104

The conference that annually takes place at Hawkesbury Agricultural College in connection with the distribution of awards won in the laying competitions of the preceding twelve months, has become an event anticipated with considerable interest by poultry-farmers, and the Bulletin that records the proceedings of the conference is, therefore, a publication that commands a wide circulation. This year it attains twenty-four pages, and contains several papers that occasioned some discussion at the time. The notice of motion that affirmed the desirability of forming a Poultry farmers' Association in New South Wales also produced an animated discussion. Copies of the Bulletin are obtainable free on application to the Under-Secretary and Director of Agriculture, Sydney.

Insectivorous Birds of New South Wales.

[Continued from page 766.]

WALTER W. FROGGATT, F.L.S., Government Entomologist.

No. 59. The Pacific Gull (*Gabianus pacificus*).

THE figure illustrating these notes is that of the Pacific Gull, common along the coasts of Australia and Tasmania, and which, with the smaller Silver Gull (*Larius novæ-hollandiæ*), are the scavengers of our sands along the sea shore, devouring all kinds of dead animal matter cast up by the waves.

These useful and handsome birds should be most carefully protected, not only on account of their useful work on sea and land, but also because of the added beauty and interest their presence give to the sea-side resorts. Anyone shooting sea gulls from the deck of a steamer or on our beaches should be promptly dealt with, and bird-lovers will agree that such a person should be treated without the option of a fine.

The Pacific Gull is the larger bird, having a total length of about 25 inches, while the Silver Gull barely measures 17 inches. They usually construct substantial open grass nests on the reefs and small islands along the coast, placed upon the ground sheltered among the grass tussocks and low shrubs. The eggs, averaging two or three in number, are olive-green, marked with dark-brown blotches. The young birds are not fully plumaged until the third year, according to Campbell, being clothed in a dull brown or mottled grey coat, afterwards replaced with the beautiful white feathers of the adults. The Silver Gulls live and breed more in small colonies, sometimes collecting, in stormy weather, in large numbers in the sheltered inlets and harbours. Their nests are often so plentiful as to form regular rookeries on the islands; they are constructed of dry grass and sea-weed, and contain from two to three greenish-olive tinted eggs covered with black or yellowish-brown markings, but both the ground colour and markings are very variable. The Silver Gull has a wide range along the coasts of Australia, Tasmania, and New Caledonia, and also has the uncommon habit, for sea birds, of going far inland to lakes and swamps, where it seems perfectly at home with the wild fowl. The writer remembers first seeing them at Lake Charm, in the Swan Hill district, Victoria, about 170 miles from the nearest ocean beach. Kept as garden pets the Silver Gulls become very tame, and hunt over the ground for noxious insects, snails, and slugs.

No. 60. The Crow.

The Family *Corvidæ* comprises a number of large birds, popularly known as Ravens, Crows, and Choughs, which at one time were all included in the typical genus *Corvus*. They are distinguished in having a stout compressed beak, straight at the base, arched towards the point, and straight at the

edges. The wings and tail are long and graduated, the feet powerful, with the metatarsus exceeding in length the middle toe of the foot. Both sexes are similar in colour, usually black and more or less glossed with green or purple tints, except in the Jackdaw and Hooded crows. Representatives of the genus are found in Europe, Asia, Africa, North America as far as Mexico, and Australia. Thus widely distributed over the world, they can stand all conditions of climate from the snow-clad mountains of Northern Scotland to the sun-dried plains of Central Australia.

Though the Australian bushman looks upon our birds as the one species under the popular and comprehensive name of Crows or Carrion Crows, among ornithologists there has always been a considerable amount of uncertainty and difference of opinion regarding the classification of our crows.

In describing our species, Gould, in his "Birds of Australia," called it *Corvus coronoides*, but in his Handbook, issued later on, he changed it to *Corvus australis*, the "White-eyed Crow," and though noting the Hazel eyed Crow considered it only a variety of the typical form. He says: "It is intermediate in size, in the development of the feathers of the throat, in its voice, in many parts of its economy, between the Carrion Crow and the Raven in our island (England), and it is difficult to say to which of these species it is most nearly allied."

Since Gould's time modern ornithologists have decided that, though the specific differences are vague, we have not only two species—the Crow and Raven—but they belong to different genera. Campbell, in his "Nests and Eggs of Australian Birds," says there still exists some uncertainty about identifying or separating our two species of crows, or the Crow from the Raven. But if the chief points as first mentioned by Dr. Ramsay as far back as 1865, and afterwards defined by Dr. Sharpe, are noted, the difficulties of identification vanish. "The Raven (*Corone australis*) is the larger bird, has eyes white in the adult, wears conspicuous long feathers on the throat, and has the base of the feathers in the hind part of the neck and back of a dusty brown or sooty colour. The true Crow (*Corvus coronoides*) has white eyes likewise, but the base of the feathers is snow-white."

Later on, however, Campbell says: "As both have white eyes, the only sure method is by handling the birds and deciding by the colouration of the feathers of the neck and back. If they are brown or sooty it is a raven, if white it is a crow."

In the latest handbook on our birds (Messrs. Le Souef and Lucas) the authors define them as follows:—"The Crow (*Corvus coronoides*) is the Hazel eyed Crow; the Raven (*Corone australis*) is the White-eyed Crow"; but they at the same time state, in describing the latter, "the iris white or dark brown." Now one could understand the ornithologists making two species (though this is doubtful when they breed together), but to place them in different genera seems to point to the fact that some genera are only a name. There is also a third species described under the name of "Small-billed Crow" (*Corvus bennetti*), peculiar to South Australia and New South Wales, allied to the carrion crow, but smaller.

Insectivorous Birds of New South Wales.
"PACIFIC GULL."
Gabianus pacificus.
Adult and Young Bird.

About one-quarter natural size.

In this paper the writer proposes to follow the bushman and treat them all just as Crows; whether they have white or brown eyes, or the down on the feathers of the back and neck is dark-coloured or white, it makes no difference to their habits.

The value or otherwise of crows in Australia is one of those debatable subjects that is a perennial source of correspondence from their admirers and enemies in the stock and pastoral newspapers. "The crow is also again becoming very troublesome, and how to deal with him is a question which divides many minds, some being for wholesale destruction, others for preservation because of his preying on vermin." The above statement is extracted from the Presidential address at the last annual meeting of the Sheep Breeders' Association in Sydney.

At the monthly meetings of the members of the Pastures Protection Board, the business of paying a standard bonus for crows' heads, and the price to be fixed per head, is frequently a topic for heated discussion.

Though there are large numbers of stock-owners who consider that the crows are not as black as they look and are more useful than harmful, and take no active measures against them, others go to the length of protecting them on account of their value in clearing up carrion and assisting to keep in check the caterpillar and grasshopper plagues. On the other hand, the majority of the coastal, as well as some of the inland, sheep-owners wage unceasing warfare against the crow, and in the annual returns issued by the Stock Branch for the year ending June, 1915, the sum of £2,862 2s. 3d. was given as the amount paid by the officers of the Pastoral Boards of New South Wales for the heads of 109,344 crows.

Many years ago I had many opportunities of studying the habits of crows on the plains between Echuca and Kerang, when looking after ewes and lambs in times of drought in Victoria. I hold no brief for the crow, and hated that black, cruel, devilish bird, when I found the fallen ewe with her eyes picked out and the helpless lamb standing beside her, with holes pecked in its tail. One would often see a pair of particularly cunning crows separating a young lamb from its bewildered mother, the first crow flying beside the scared, running lamb, every now and then flapping its wings against the poor little beast, while the second crow would deliberately fly up behind and peck it on the rump to hurry it away from the mob. At other times one would come upon a lost lamb on the plains with a crow flapping round, and every now and then giving a tug to its tail to try and pull it to the ground.

The sheep-owners will tell you that a sheep or lamb pecked, when down, by crows seldom lives, and put it down to the fact that they are carrion feeders and cause blood poisoning. Of course, in bad times with starving stock, many of the old ewes and lambs that get down would never recover, even in the absence of the attendant crows, but such facts do not have much weight with the sheep man when he finds the crows helping in the survival of the fittest.

The farmer dislikes the crows quite as much as the squatter, and seldom has a good word to say for them. If he runs sheep, he generally has more culls and old sheep in proportion to the size of his flock, and they are the ones that suffer from the crows. The crow is also an expert at stealing eggs, and his depredations in the fowl yard are only too well known to the housewife. I used to visit a homestead on the plains in Victoria, where three crows formed a syndicate to raid the fowl nests in the stable, where they had the advantage of open gable ends, giving a ready means of ingress and retreat. Their method was as follows: the first crow flew into a she-oak tree overlooking the house and stable, and finding all quiet, evidently sent back word, for the second crow flew up and took observations while resting on the roof of the stable; a fresh signal was sent back, when the third crow flew up, hopped down into the manger, and snapped up the egg before the hen had finished cackling, and flew away down the paddock, followed by the two scouts. Many traps and ambushes were laid for the egg-stealers, but as far as I know my friend never managed to get the best of them.

The crow is accused, probably not without reason, of destroying the eggs and nestlings of smaller birds, and it is quite evident that other birds do not trust him, for at nesting time if a crow comes into the tree, all the small birds join together to hustle and drive him away.

Having given some account of the bad habits of the crow, I would now describe some of his good traits. It is worthy of note that the majority of the squatters who wage war upon the crow, belong to the coastal and eastern divisions of the State, while it is the men of the west who consider the work of a scavenger and killer of blow-fly maggots and other insect pests outweighs any damage he does to their flocks.

While there is no question as to the damage the crows, when numerous, do at lambing time, particularly in a bad season when ewes and lambs are weak and starved, during the other portion of the year in the same districts the crow acts as an effective scavenger in cleaning up offal and also destroys many noxious insects, hunting over the paddocks like the magpie, and is very busy when a cutworm army or a locust swarm appears in the district.

In the west the crow does yeoman service in the destruction of dead carcases. I have seen many dead sheep so devoured that only the skin and bones remained, half of the skin being almost intact; dead rabbits are torn to bits, and the maggots destroyed that would otherwise have entered the ground and escaped. When a dead horse or bullock is skinned it is the crows that set to work to strip the bones. In confirmation of this, I would append the following remarks, made by well-known pastoralists, in reply to a circular sent out for information regarding the crow and the blow-fly pest:—

Bourke.—"I myself do not think that the crow is really harmful. I have always regarded the crow as a good friend, in spite of the fact that he sometimes kills a weakling lamb, and perhaps hastens the death of a weak sheep.

About one-third natural size.

INSECTIVOROUS BIRDS OF NEW SOUTH WALES.

"WHITE-EYED CROW OR RAVEN."

Corone australis.

I believe the first obvious step to take in mitigating the blow-fly pest is to stop the destruction of the crow. He kills many rabbits, is the most effective enemy of grasshoppers in certain stages, and is the best of scavengers. I have no doubt he is the best natural enemy of the blow-fly."

Condobolin. "Consider the crow far and away the best scavenger and destroyer of maggots. The magpie comes next."

Coonamble.—"The crow is the only bird that I know of that would do any good. He would destroy the carcase by eating and pulling it about. If we had the millions of crows that have been killed, we would not be troubled with the blow-fly."

Canonbar.—"I am inclined to protect the crow, except during lambing time. They do much good."

Crowfoot, writing in the *Pastoral Review* upon "Bird Friends," says:—"I must not close without putting in a good word for the crow. He is a friend in disguise, notwithstanding his cruelty to lambs and weak sheep. If they would only leave the "woollies" alone, they would be as sacred as the ibis and kingfisher in the flock-owners' mind, but as it is 'no license' is bracketed against the name of crow. If all the locusts' eggs, grubs, caterpillars, and food that maggots love to dwell in were balanced against the lambs and grown sheep crows destroy, the balance would be strongly in their favour."

In conclusion, I would quote Mr. W. E. Abbott, of Wingen, who has always been a firm friend of the crow. After telling how he has found the remains of dead sheep picked clean by the crows, he says:—"It seems to me that one crow with its unequalled sense of sight and smell, and power of locomotion, would be worth more than 100 men, whose work could not be supervised (in destroying dead carcases). The 100 men would cost at least £200 a week, and a crow would keep himself to a small extent on eggs or chickens, and a few weak lambs or old sheep in times of drought."

The bushman, while he is interested in the knowing ways of the cosmopolitan crow, does not particularly love that bird, but in his wanderings comes across him in all parts of the great lone land. It wakens him with its mocking mournful cry when sick and weary in his lonely camp. If he happens to get lost in the scrub, hunting for his horses, away from water, the crows appear, and the inflections in their voices seem to distinctly change, no longer the sharp clear caw caw, but these notes are long drawn out, sounding to the anxious bewildered traveller in evil tone, "When are you going to die—DIE?"

Many are the stories told round the camp, regarding the wisdom of the crow,—how when an inquisitive crow arrived at a camp where the traveller is resting under the trees apparently asleep, it will pick up a bit of dry bark in its beak, and flying up into the gum tree, drops it on the face of the sleeper to see if he is really asleep or only shamming, before it ventures to come around, and pick up the scraps.

The outback bushman will tell you he has seen a crow when it has discovered the unprotected eggs in an emu's nest among the saltbush, hunt round for a stone, pick it up in its claws, and hovering over the nest, drop the stone among the eggs, and thus secure an ample dinner. This story may be quite correct—there is very little a wary old western crow does not know—but it lacks confirmation.

In conclusion, it will be seen that like other of our insectivorous birds the crow has a dual character. While he is one of our most useful insectivorous birds, and by far the best cleaner-up of offal and carrion in Australia, and taking his work all over the State, does far more good than harm, yet he may become a very serious local pest. This usually comes about through an undue increase in their numbers in a certain district, and the consequent failure of their food supplies. Under a properly adjusted Bird Protection Act, the crow while enjoying the protection he merits in his own district, could easily be proclaimed a pest when he begins his attack upon lambs and lambing ewes in the district where he is doing the damage.

"Giant Fescue" on the South Coast.

An Ulladulla correspondent recently applied to the Department for information regarding *Festuca arundinacea.* He says:—

I have had a few roots of this grass under observation for some time past, and feel greatly impressed as to its possibilities for the South Coast. It happens to be always green, and when cattle or horses have access to it they immediately crop it down, notwithstanding that it has a wide flag and is rough both in appearance and to the touch. I heard recently that this grass is coming greatly into favour with dairymen and others in New Zealand. About six weeks ago I broke up the clumps or stools from a few roots I started with, and planted these portions out for the purpose of obtaining a supply of roots and possibly seed to deal with a larger area. The small portions broken from the stools are already making headway, notwithstanding heavy frosts. I am inclined to think this grass would stand heavy grazing, and in some ways be more desirable than *Paspalum dilatatum.*

In reply, Mr. E. Breakwell, B.A., B.Sc., Agrostologist to the Department, stated:—

In most cases where the grass has been tried it has proved very successful. It is grown to a small extent on the New England Tableland and the Manning River, and at some of the Experiment Farms; it is also being tried at the present time in the Farmers' Experiment Plots on the Coast. Although a tussocky grass it is a fairly palatable one for large stock, and is very resistant to frost and drought. On moist or low-lying lands it will stand heavy tramping and feeding, and in such situations spreads rapidly. It appears well adapted to volcanic and alluvial soils or even soils of a light, dry gravelly nature, but is probably unsuited to soils of a very clayey character.

The seed is obtainable from leading Sydney seedsmen under the name of *Festuca elatior arundinacea.* Care should be taken to distinguish between this and another grass sold as "Meadow Fescue," which is similar in structure but which has a much narrower leaf, and is smaller altogether than the Giant Fescue in question.

Sixth Annual Report of the Demonstration Area, Bathurst Experiment Farm, 1914-15.

R. W. PEACOCK, Manager.

A VERY substantial profit is shown for the past season. Such was brought about by a combination of abnormal factors, and cannot be considered as possible during normal seasons. It is therefore excluded from the general average. The profit of £3 12s. per acre was due to the high prices caused by the disastrous drought and the international crisis. The Bathurst District was not affected by the droughty conditions to the same extent as other sections of the Commonwealth, and satisfactory crops were grown for which excellent prices were obtained. Excellent crops were grown upon the area, but the most could not be made of them without interfering with the underlying objects of the farm; for instance, greater profits were certain if the heavy crops had been cut for hay, but the production of pure seed for farmers was the objective, and the price obtained for such was no greater than during previous years. The main factor in the increased returns was the very high prices obtained for straw, which were quite exceptional. Such high prices increased considerably the cost of thatching.

The previous basis of calculating the value of fodder crops was adhered to. The high price of sheep, and the greater value of the fodder would have justified a higher rate being credited to the various paddocks, but such was not done.

The average profit for the preceding five years was £1 9s. 8d. per acre.

The farm practice, as carried out during past seasons, has been adhered to, except in the case of paddock No. 5. A further crop of hay was taken off it in order to more evenly divide the area into two portions, one for main cereals, and the other for fodder crops each year. This system allows of a period of five months bare fallow prior to sowing the main cereal crops.

The profits for the last six years:—

Year.		Per acre. £	s.	d.
1909	... ...	1	8	8¼
1910	... ...	1	3	3
1911	... ...	1	18	3
1912	... ...	0	13	10
1913	... ...	2	4	4
1914	... ...	3	12	0

The results have, as usual, been submitted in two different ways—No. 1 showing cost of operations and actual receipts, the profit being £3 12s. per acre; No. 2 showing the cost of operations, and the prices which could have been obtained by the ordinary farmer for his produce, the profit in this case being £3 9s. 11d. per acre.

The detailed statement of the various operations plainly shows the farm practice, varieties used, dates of sowing, seed per acre, &c.

The area was not kept strictly for the varieties of proved merit, but owing to the demand for seed of other varieties by the Department and farmers, several were grown which in some measure reduced the yield.

A tabulated statement of costs is given. The costs of stooking, carting and stacking are varied somewhat in relation to the size of crop, but in no case were they less than in the statement.

A full statement with regard to the farm practice, rotation, short fallow, alternating fodder crop, plant diseases, rainfall, manuring, general results, varieties, features of the season, and the treatment and yield of the crops was published in the April issue, to which readers are referred.

TABLE INDICATING COSTS OF THE VARIOUS OPERATIONS, &C.

Six-inch ploughing	8s. per acre.
Four-inch ploughing	4s. 6d. per acre.
Cultivating	2s. per acre.
Drilling	2s. 3d. per acre.
Seed wheat	6s. per bushel.
Seed oats	4s. per bushel.
Superphosphate (price under contract)	£4 5s. per ton.
Superphosphate (price paid by the farmer)	£4 10s. per ton.
Cutting with binder	4s. per acre.
Twine	1s. 6d. to 2s. per acre.
Stooking	2s. to 2s. 6d. per acre.
Carting and stacking	7s. 6d. to 10s. per acre.
Threshing	5½d. per bushel.
Treating seed	2d. per bushel.
Bags and twine	2¾d. per bushel.
Rent per annum	8s. 4d. per acre.

Paddock No. 1.

Cleveland Wheat for Grain. Area, 14·33 acres.

Statement No. 1.

Dr.

	£	s.	d.
To Ploughing, 6 inches deep, at 8s. per acre	5	14	8
2 Ploughings, 4 inches deep, at 4s. 6d. per acre ..	6	9	6
Drilling seed, at 2s. 3d. per acre	1	12	3
Seed—Cleveland wheat, 6½ bushels at 6s. per bushel	1	19	0
Treating seed, at 2d. per bushel	0	1	1
Superphosphate, 5 cwt., at 85s. per ton	1	1	3
Pulling strangers (3 times, 5 hours each, 1 man at 1s. per hour and 2 students at 5d. per hour each) ...	1	7	6
Cutting with binder at 4s. per acre	2	17	4
Twine, at 2s. per acre ...	1	8	8
Stooking, at 2s. 6d. per acre	1	15	10
Carting and stacking, at 10s. per acre	7	3	4
Threshing, at 5½d. per bushel	8	16	3
Carting to barn, at ½d. per bushel	0	16	0
Grading, at 2d. per bushel ...	3	4	0
Bags and twine, at 2¾d. per bushel	4	8	0
Carting to rail, at 1d. per bushel	1	12	0
Thatching straw stack (labour)	2	2	6
Straw, &c., for thatching (straw at £5 per ton) ...	5	12	6
Rent (16 months), at 11s. 1d. per acre	7	18	10
Auctioneer's charges—			
Commission at 5 per cent.	3	1	10
Advertising	0	7	3
Balance (profit)	122	2	7
	£191	11	8

Cr.

	£	s.	d.
By Agistment on stubble—·84 sheep per acre for 5 months at 1s.	3	0	2
Wheaten hay—			
1 ton 16 cwt. 3½ qrs. at £7 10s. per ton	13	16	7
Wheat—			
335 bushels 12 lb. 1st grade (seed) at 6s. per bushel	100	11	2
49 bushels 25 lb. milling at 5s. per bushel ...	12	7	1
Wheaten straw (sold by auction)	60	6	8
Wheaten cavings (sold by auction)	1	10	0
	£191	11	8

Statement No. 2.—Superphosphate is increased by 1s. 3d., and pulling strangers (£1 7s. 6d.), carting to barn (16s.), and grading (£3 4s.) are omitted, thus reducing total cost to £64 2s. 10d. The returns from 384 bushels 37 lb. of wheat at 5s. per bushel, would be £96 3s. 1d.; profit, £110 13s. 8d.

Paddock No. 1a.

Cleveland Wheat for Grain. 7·11 acres.

Statement No. 1.

Dr.	£	s.	d.	*Cr.*	£	s.	d.
To Ploughing, 6 inches deep, at 8s. per acre	2	16	11	By Agistment on stubble—2·12 sheep per acre for 5 months at 1s.	3	15	4
2 Ploughings, 4 inches deep, at 4s. 6d. per acre ..	3	4	0	Wheaten hay—18 cwt. 1 qr. at £7 10s. per ton	6	16	10
Drilling seed, at 2s. 3d. per acre	0	16	0	Wheat—159 bushels, 1st grade (seed) at 6s. per bushel	47	14	0
Seed—Cleveland wheat, 3 bushels 24 lb., at 6s. per bushel	1	0	5	36 bushels 1 lb., milling, at 5s. per bushel ..	9	0	1
Treating seed, at 2d. per bushel	0	0	7	Wheaten straw (sold by auction)	30	3	4
Superphosphate, 2½ cwt., at 85s. per ton	0	10	8	Wheaten cavings (sold by auction)	0	15	0
Pulling strangers (3 times, 3 hours apiece, 1 man at 1s. per hour and 2 students at 5d. per hour each) ...	0	16	6				
Cutting with binder at 4s. per acre	1	8	5				
Twine, at 2s. per acre ..	0	14	3				
Stooking, at 2s. 6d. per acre	0	17	9				
Carting and stacking, at 10s. per acre	3	11	1				
Threshing, at 5½d. per bushel	4	9	5				
Carting to barn, at ½d. per bushel	0	8	1				
Grading, at 2d per bushel...	1	12	6				
Bags and twine, at 2¾d. per bushel	2	4	8				
Carting to rail, at 1d. per bushel	0	16	3				
Thatching straw stack (labour)	1	5	0				
Straw, &c., for thatching (straw at £5 per ton) ...	3	15	0				
Rent (16 months) at 11s. 1d. per acre	3	18	10				
Auctioneer's charges—Commission at 5 per cent.	1	0	11				
Advertising	0	3	6				
Balance (profit)	62	13	10				
	£98	4	7		£98	4	7

Statement No. 2.—Superphosphate is increased by 7d., and pulling strangers (16s. 6d.), carting to barn (8s. 1d.), and grading (£1 12s. 6d.) omitted, thus reducing total cost to £32 14s. 3d. The returns from the sale of 195 bushels 1 lb. of wheat at 5s. per bushel would be £48 15s. 1d.; profit, £57 11s. 4d.

Paddock No. 2.

Algerian Oats for Grain. 31·18 acres { 22·58 acres, Grain. 8·60 acres, Hay.

Statement No. 1.

Dr.	£	s.	d.	*Cr.*	£	s.	d.
To Ploughing 6 inches deep, at 8s. per acre	12	9	5	By Agistment on stubble—·82 sheep per acre for 5 months at 1s.	6	7	10
2 Ploughings, 4 inches deep, at 4s. 6d. per acre ...	14	0	8	Oaten hay—13 tons 1 cwt. at £7 10s. per ton	97	17	6
Drilling seed, at 2s. 3d. per acre	3	10	2	Oats—800 bushels 20 lb. seed, &c., at 4s. per bushel...	160	2	0
Seed—Algerian oats, 34 bushels, at 4s. per bushel	6	16	0	Oaten straw stack (auctioned)	75	0	0
Treating seed, at 2d. per bushel	0	5	2	Oaten cavings	3	0	0
Superphosphate, 11¾ cwt. at 85s. per ton	2	9	11				
Cutting with binder at 4s. per acre	6	4	9				
Twine, at 2s. per acre ...	3	2	4				
Stooking, at 2s. 6d. per acre	3	17	11				
Carting and stacking, at 10s. per acre	15	11	10				
Threshing, at 4d. per bushel	13	6	10				
Thatching straw stack (labour)	2	15	0				
Straw, &c., for thatching. (straw at £5 per ton) ...	7	10	0				
Carting to barn, at ½d. per bushel	1	13	4				
Grading, at 1¾d. per bushel	5	16	9				
Bags and twine, at 2¾d. per bushel	9	3	5				
Carting to rail, at ¾d. per bushel	2	10	0				
Rent (16 months) at 11s. 1d. per acre	17	5	7				
Auctioneer's charges—							
Commission at 5 per cent.	3	15	0				
Advertising	0	15	6				
Balance (profit)	209	7	9				
	£342	7	4		£342	7	4

Statement No. 2.—Superphosphate is increased by 3s., and carting to barn (£1 13s. 4d.) and grading (£5 16s. 9d.) omitted, reducing total cost to £125 12s. 6d. Owing to the high prices ruling for oats, the returns will be the same as in Statement 1. Profit, £216 14s. 10d.

Paddock No. 2a.

Federation (7 acres), Rymer (3 acres), Huguenot (2 acres), John Brown (2 acres), for Grain. Area, 15·36 acres.

Statement No. 1.

Dr.

	£	s.	d.
To Ploughing, 6 inches deep, at 8s. per acre	6	2	11
Ploughing, 4 inches deep, at 4s. 6d. per acre	3	9	1
Drilling, at 2s. 3d. per acre...	1	14	7
Seed, 8 bushels 6 lb., at 6s. per acre	2	8	7
Treating seed, at 2d. per bushel	0	1	4
Superphosphate, 5¼ cwt., at 85s. per ton	1	2	4
Strangering (3 times 6 hours apiece, 1 man at 1s. per hour, and 2 students at 5d. per hour each) ...	1	13	0
Cutting with binder at 4s. per acre	3	1	5
Twine, at 1s. 6d. per acre ...	1	3	0
Stooking, at 2s per acre ...	1	10	9
Carting and stacking, at 7s. 6d. per acre ...	5	15	2
Threshing, at 5½d. per bushel	6	16	5
Carting to barn, at ½d. per bushel	0	12	5
Grading, at 2d. per bushel ...	2	9	7
Bags and twine, at 2¾d. per bushel	3	8	2
Carting to rail, at 1d. per bushel	1	4	10
Thatching straw stack (labour)	2	5	0
Straw, &c., for thatching (straw at £5 per ton) ...	5	12	6
Rent (16 months) at 11s. 1d. per acre	8	10	3
Auctioneer's charges—			
Commission at 5 per cent.	2	18	2
Advertising	0	7	9
Balance (profit)	101	13	7
	£164	0	10

Cr.

	£	s.	d.
By Agistment on stubble 1·087 sheep per acre for 5 months at 1s. per acre ...	4	3	6
Wheaten hay—			
1 ton 19 cwt. 14 lb. at £7 10s. per ton	14	17	7
Wheat—			
247 bushels 8 lb. 1st grade (seed) at 6s. per bushel...	74	2	10
50 bushels 35 lb. (mill) at 5s. per bushel	12	12	11
Wheaten straw (sold by auction)	58	4	0
	£164	0	10

Statement No. 2.—Superphosphate is increased by 1s. 4d., and pulling strangers (£1 13s.), carting to barn (12s. 5d.), and grading (£2 9s. 7d.) omitted, reducing total cost to £57 13s. 7d. The returns from the sale of 297 bushels 43 lb. of wheat at 5s. per bushel would be £74 8s. 7d.; profit, £94 0s. 1d.

Paddock No. 5.

Algerian Oats for Hay. 10·39 acres.

Dr. *Statement No.* 1. *Cr.*

	£	s.	d.		£	s.	d.
To Ploughing, 4 inches deep, at 4s. 6d. per acre	2	6	9	By Agistment on stubble—1·9 sheep per acre for 5 months, at 1s.	4	18	8
Cultivation, 3 inches deep, at 2s. per acre	1	0	9	Oaten hay—16 tons 11 cwt. 2½ qrs. at £7 10s. per ton ...	124	7	2
Drilling seed, at 2s. 3d. per acre	1	3	5				
Seed, Algerian oats, 11½ bushels at 4s. per bushel ...	2	6	0				
Treating seed, at 2d. per bushel	0	1	11				
Superphosphates, 6 cwt. at 85s. per ton	1	5	6				
Cutting with binder at 4s. per acre	2	1	7				
Twine, at 1s. 6d. per acre ...	0	15	7				
Stooking, at 2s. per acre ..	1	0	9				
Carting and stacking, at 7s. 6d. per acre	3	17	11				
Thatching (labour)	1	10	0				
Straw, &c., for thatching (straw at £5 per ton) ...	4	10	0				
Rent (16 months), at 11s. 1d. per acre	5	15	1				
Balance (profit)	101	10	7				
	£129	5	10		£129	5	10

Statement No. 2.—The cost of superphosphate is increased to £1 7s., reducing the profit to £101 9s. 1d. All other items are the same. Profit, £101 9s. 1d.

Paddock No. 6.

Algerian Oats for Fodder. 24·89 acres.

Dr. *Statement No.* 1. *Cr.*

	£	s.	d.		£	s.	d.
To Ploughing, 4 inches deep, at 4s. 6d. per acre	5	12	0	By Agistment—3·5 sheep per acre for 5 months, at 1s.	21	15	7
Drilling seed, at 2s. 3d. per acre	2	16	0				
Seed, Algerian oats, 25¾ bushels at 4s. per bushel ...	5	3	0				
Superphosphate, 15 cwt. at 85s. per ton	3	3	9				
Treating seed, at 2d. per bushel	0	4	4				
Rent (8 months), at 5s. 7d. per acre	6	18	11	Balance (loss)	2	2	5
	£23	18	0		£23	18	0

Statement No. 2.—At the higher price of superphosphate the total cost would be £24 1s. 9d., and the account is balanced by the value of the agistment.

Paddock No. 10.

Bobs (6¾ acres), Nardoo (2 acres), Thew (1¼ acres) for Grain. 10·2 acres.

Statement No. 1.

Dr.	£	s.	d.	*Cr.*	£	s.	d.
To Ploughing, 6 inches deep, at 8s. per acre	4	1	7	By Agistment on stubble ·57 sheep per acre for 5 months, at 1s.	1	9	1
Ploughing, 4 inches deep, at 4s. 6d. per acre .	2	5	11	Wheaten hay—			
Drilling, at 2s. 3d. per acre..	1	3	0	1 ton 6 cwt., at £7 10s. per ton	9	15	0
Seed, 5 bushel 34 lb. at 6s. per bushel	1	13	5	Wheat—			
Treating seed, at 2d. per bushel	0	0	11	150 bushels 38 lb. 1st grade (seed), at 6s. per bushel	45	3	10
Superphosphate, 3½ cwt. at 85s. per ton	0	14	10	27 bushels 50 lb. (mill), at 5s. per bushel	6	16	8
Pulling strangers (3 times of 4 hours each, 1 man at 1s. per hour and 2 students at 5d. per hour) ...	1	2	0	Wheaten straw—			
Cutting with binder, at 4s. per acre	2	0	10	7 tons 9 cwt. (sold by auction)	33	10	6
Twine, at 1s. 6d. per acre ...	0	15	4				
Stooking, at 2s. per acre ...	1	0	5				
Carting and stacking, at 7s. 6d. per acre... ...	3	16	6				
Threshing, at 5½d. per bushel	4	1	7				
Carting to barn, at ½d. per bushel	0	7	5				
Grading, at 2d. per bushel...	1	9	8				
Bags and twine, at 2¾d. per bushel	2	0	9				
Carting to rail, at 1d. per bushel	0	14	10				
Thatching straw stack ...	1	10	0				
Straw, &c., for thatching (straw at £5 per ton)...	4	10	0				
Rent (16 months), at 11s. 1d. per acre	5	13	1				
Auctioneer's commission, 5 per cent.	1	13	6				
Balance (profit)	55	19	6				
	£96	15	1		£96	15	1

Statement No. 2.—Superphosphate is increased by 11d., and pulling strangers (£1 2s.), carting to barn (7s. 5d.), and grading (£1 9s. 8d.) omitted, reducing total cost to £37 17s. 5d. The returns from 177 bushels 58 lb. of wheat at 5s. per bushel would be £44 9s. 10d.; profit, £51 7s.

Paddock No. 11.

Algerian Oats for Fodder. 31·32 acres.

Statement No. 1.

Dr.	£ s. d.	*Cr.*	£ s. d.
To Ploughing, 4 inches deep, at 4s. 6d. per acre... ...	7 0 11	By Agistment—4·03 sheep per acre for 5 months, at 1s.	31 11 1
Drilling seed, at 2s. 3d. per acre	3 10 6		
Seed—Algerian oats, 36 bushels at 4s. per bushel	7 4 0		
Superphosphate, 18½ cwt. at 85s. per ton	3 18 7		
Treating seed, at 2d. per bushel	0 6 0		
Rent (8 months), at 5s. 7d. per acre	8 14 10		
Balance (profit)	0 16 3		
	£31 11 1		£31 11 1

Statement No. 2.—At the higher cost of superphosphate, total cost would be £31 1s. 7d., and is balanced by the value of the agistment.

Paddock No. 12.

Algerian Oats for Fodder. 28·25 acres.

Statement No. 1.

Dr.	£ s. d.	*Cr.*	£ s. d.
To Ploughing, 4 inches deep, at 4s. 6d per acre... ...	6 7 1	By Agistment—3·63 sheep per acre for 5 months, at 1s.	25 12 9
Drilling seed, at 2s. 3d. per acre	3 3 7	Balance (loss)	1 12 9
Seed—Algerian oats, 31½ bushels, at 4s. per bushel	6 6 0		
Superphosphate, 15½ cwt. at 85s. per ton	3 5 10		
Treating seed, at 2d. per bushel	0 5 3		
Rent (8 months), at 5s. 7d. per acre	7 17 9		
	£27 5 6		£27 5 6

Statement No. 2.—At the higher cost of superphosphate, total cost would be £27 9s. 5d., and is balanced by the value of the agistment.

Summary of the No. 1 Statements.

Based upon cost of operations and upon the actual receipts.

Paddock.	Profit.	Loss.
	£ s. d.	£ s. d.
No. 1	122 2 7	....
,, 1A	62 13 10	....
,, 2	209 7 9	....
,, 2A	101 13 7	....
,, 5	101 10 7	....
,, 6	....	2 2 5
,, 10	55 19 6	....
,, 11	0 16 3	....
,, 12	....	1 12 9
	£654 4 1	£3 15 2
	£650 8 11	....

Net profit per acre of £3 12s. for whole area of 180¾ acres.

Summary of the No. 2 Statements.

Based upon cost of operations and upon the price a farmer would receive for his produce.

Paddock.	Profit.
	£ s. d.
No. 1	110 13 8
,, 1A	57 11 4
,, 2	216 14 10
,, 2A	94 0 1
,, 5	101 9 1
,, 6 (cost balanced by agistment)	....
,, 10	51 7 0
,, 11 (cost balanced by agistment)	....
,, 12 ,, ,, ...	....
	£631 16 0

Net profit per acre of £3 9s. 11d. for whole area of 180¾ acres.

Weather Conditions.

The particulars with regard to the season's rainfall may be presented in the following form:—

Months.	No. of Wet Days	Rainfall.	Frosts
		Points.	Number.
January	9	134	....
February	7	126	....
March	9	446	......
April . ..	7	154	7 (first frost 11th)
May	8	183	13
June	5	87	20 (snow on 20th).
July	20	201	14 (,, 29th).
August	6	5	23
September	7	115	17
October	6	227	2
November	10	346	....
December	10	227	. .....
Totals	104	2,251	96

General Results.

The highest yield was given by Cleveland, viz., 29½ bushels, Paddock No. 1A, in which the best crop was grown, suffered very much from the depredations of sparrows, which considerably reduced the yield.

Algerian oats averaged 35½ bushels, the frosts having reduced this yield by fully 10 bushels. The yield of hay was 1 ton 18 cwt. from the area cut for hay in this paddock.

The average yield of wheat was 25 bushels 42 lb. per acre.

The accompanying tabular statement sets out the treatment of the various paddocks, the nature of the crops, and the yield per acre.

Varieties.

The three main varieties recommended for the district are Cleveland for early sowing, Federation for mid-season, and Bobs for late sowing.

Cleveland proved the best of the three mentioned. Federation has not yielded up to its reputation here for several years; it was rather rusty this season, and also suffered badly from "take-all." Bobs gave a satisfactory yield, but the severe storms when it was nearly ripe caused it to lodge rather badly.

Rymer again proved a good yielder, and came second to Cleveland. Huguenot and Thew, which gave the lowest returns, should not have been sown on the Demonstration Area, but pure seed was required, and no other area was available; the effect was to reduce the average.

Features of the Season.

The outstanding features of the season were (1) good early rains ensuring vigorous early development: (2) a dry mild winter, and a spring that commenced several weeks earlier than in normal seasons; (3) severe frosts at a critical time, combined with dry conditions; and (4) a wet early harvesting period.

Demonstration Area, Bathurst Experiment Farm, 1914–15.

STATEMENT of Treatment, Yields, &c., of Crops.

Paddock.	Area.	Variety.	Previous Crop.	Treatment.	Seed per acre.	Super-phosphate per acre.	Date sown.	Date harvested.	Yield per acre.	Remarks.
No.	acres.				lb.	lb.	1914.	1914.	bus. lb.	
1 ..	13·11	Cleveland ..	Cape Barley and Rape.	Ploughed 6 in. deep on 13/10/13; 4 in. deep on 16/1/14; 4 in. deep on 2/4/14.	27	39½	7 April	30 Nov.	29 20	About 1 acre near the dam affected by frost.
1A ..	6·64	Cleveland ..	Algerian Oats ..	Ploughed 6 in. deep on 10/10/13; 4 in. deep on 9/1/14; 4 in. deep on 1/3/14.	28½	39½	2 April	28 Nov.	29 22	A fair percentage affected by frost.
2 ..	22·58	Algerian Oats for grain.	Algerian Oats and Rape.	Ploughed 6 in. deep on 17/10/13; 4 in. deep on 20/1/14; 4 in. deep on 9/4/14.	54½	41¼	17 April	26 Nov.	35 18	Seriously affected by frost on the lowest land.
2 ..	6·76	Algerian Oats for hay.	do do ..	do do ..	54½	41¼	17 April	9 Nov.	ton cwt. 1 18½	
2A	6·88	Federation ..	do do ..	Ploughed 6 in. deep on 2/10/13; 4 in. deep on 20/4/14.	36	38	25 April	2 Dec.	bus. lb. 21 57	Federation badly affected by "take-all"; about one-third damaged.
	2·65	Rymer	do do ..	do do ..	32	38	25 April	5 Dec.	28 54	Frosted.
	1·57	Huguenot ..	do do ..	do do ..	30	38	25 April	8 Dec.	15 32	
	1·98	John Brown ..	do do ..	do do ..	37	38	25 April	5 Dec.	22 36	
5 ..	10·39	Algerian Oats for hay.	Algerian Oats for hay.	Ploughed 6 in. deep on 27/1/14; cultivated on 31/3/14.	55½	64½	1 April	6 Nov.	ton cwt. 1 12½	
10	5·87	Bobs	Cape Barley and Rape.	Ploughed 6 in. deep on 31/10/13; 4 in. deep on 24/4/14.	34	38½	28 April	23 Nov.	bus. lb. 23 24	
	·98	Thew	do do ..	do do ..	33	38¼	30 April	17 Nov.	12 40	
	2·79	Nardoo	do do ..	do do ..	29	38½	28 April	24 Nov.	22 5	

Average yield of grain per acre: Wheat, 25 bus. 42 lb.; Oats, 35 bus. 18 lb.

On Tagasaste.

With a Plea that it be given a Fair Trial in Australia.

J. H. MAIDEN,
Government Botanist of New South Wales, and Director, Botanic Gardens, Sydney.

In the Canary Islands, off the north-west coast of Africa, are a number of shrubs belonging to the Pea Family (Leguminosæ), amongst others *Cytisus proliferus*, L. f., which is known to botanists in three forms:—

1. Variety *palmensis* Christ.
2. Variety *Canariæ* Christ.
3. Variety *angustifolia* O. Ktze. (apparently the typical form of *C. proliferus* L. f.).

All three are fodder plants, but No. 1, which is locally known as "Tagasaste," is very much superior to the others, and one of the objects of this paper is to clear up a certain amount of misapprehension which has grown up around it and them in Australia. Nos. 2 and 3 are never called "Tagasaste" except in error, and in an Appendix, the botanical and other differences between the various forms will be clearly set out.

Much of the information in this brief paper I have received from Dr. G. V. Perez, of Santa Ursula, Teneriffe, a valued correspondent of many years.

As far back as 1865 Dr. Victor Perez and Dr. Paul Sagot wrote in the *Journal de l'Agriculture des Pays Chauds*, 1865–1867, that botanists could only see in the Tagasaste a variety of Escobon (*Cytisus proliferus* L. f.). They published their articles later on in pamphlet form in Paris (Challamel Ainé, 1867), where at pages 12 and 13 are notes under the heading "Tagasaste, vari du *Cytisus proliferus*." Dr. Perez had previously published in Spanish (1865) another pamphlet on Taga-aste, in which he states the same

Dr. Christ, of Basle, in Engler's *Botan. Jahrbucher* (9 Band, 1–2 Heft, 1887), under the title "Spicilegium Canariense," at page 120, describes Tagasaste as *C. proliferus* L. f., variety *palmensis*.

Dr. G. V. Perez, after the death of his father (Dr. Victor Perez) and of Dr. Sagot, published a pamphlet under the title Le Tagasaste, *C. proliferus* var. (1892, Paris), at the libraire A. Challamel, 17 Rue Jacob.

Dr. Victor Perez placed seed at the disposal of Kew, whence it was dis tributed in 1879 in many parts of the Empire deemed suitable for it.

The *Kew Bulletin*, 1891, p. 239, contains extracts from the various Kew Reports, from 1879 onwards, referring to this plant. The same publication, p. 241, contains a useful account of Tagasaste, by Dr. Victor Perez, which is worthy of reference.

For further economic details see *Kew Bulletin*, 1893, p. 116.

Here follow some notes contained in letters from Dr. G. V. Perez to me :—

Tagasaste when cut back sprouts readily, and continues doing so for many years. It stands drought splendidly, owing to its deep roots. In this it resembles many Canary Islands plants, which are all accustomed to rainless summers; in fact, in the Canaries it does not rain from May to October, both included, or during half the year.

The seed germinates badly and often lies in the ground for years. It should be boiled previously, and sown during the first rains. The amount of seed necessary per acre is about 8 lb. Seedling beds can also be made and then transplanted; possibly bamboo sowing might be of great service.

The plants should be kept cut back and the trunk not allowed to exceed 3 feet in height. Tagasaste begins to yield in the second or third year.

Dr. Perez surmises that for Australia the best would be to have fields conveniently planted where horses and cattle could eat it from the plants, as this is the cheapest method. Cut the plants at least twice a year; it pollards very well. Do not allow it to grow into a tall bush or tree, as it then gets woody.

Let me quote again the case of the Island of Palma (Canary Islands), where for long years past it has been cultivated by the local farmers with brilliant success. Fields planted with it are sold, and the buyers put their horses, cows, and even pigs to feed from the plants, and they simply strip them, devouring every leaf.

We (Dr. G. V. Perez is the owner of several farms, including dairy farms) have used Tagasaste in the green state mixed with chaffed straw for horses and cows with excellent results. As fermented hay it is still better. I have also tried it as silage. The hay has nearly 13 per cent. of nitrogenous substance.

Analysis of Tagasaste hay made by Dr. George V. Perez and sent to the Instituto Agricola de Alfonso xii for analysis, Madrid, 1893 :—

	Per cent.
Water	11·00
Ashes	6·50
Protein	12·81
Cellulose	16·00
Extracted matter (non-nitrogenous)	51·89
Fat	2·80

In 1864 and 1865 the late Dr. Victor Perez made an analysis of Tagasaste which gave nitrogen 1·134, whereas that of the best local Teneriffe pasture gave him nitrogen 1·028.

Monsieur Gassend, in the laboratory of the Agricultural Station of Melun, France, obtained from fresh flowering twigs sent to him from Antibes (South France) nitrogen 1·470 per cent.

A yoke of oxen or cows eat daily 100 lb. of green Tagasaste mixed with straw. Each plant yields 3½ lb. of green food for every time it is cut back, or if it is cut twice a year 7 lb. Reckoning roughly the number of plants per acre at 3,200, it would produce 27,400 lb. per annum, or food for 274 days for two oxen per acre.

Cattle and horses brought up on it would eat it readily from the plantation if planted in rows. If cut by hand it is better given with chaffed straw.

Please lay stress on the fact that it fattens horses like no other food I know, and it gives them a beautiful coat; that, of course, while they are eating green meat of Tagasaste they cannot be worked, as they sweat and get out of breath easily, but that to rear them there is nothing like it, and that is how, from time immemorial, the Palma ponies have been reared. They have excellent hoofs, and go about unshod. For oxen, sheep, &c., it is unrivalled.

Tagasaste hay is still better, but more expensive. Whilst the green plant is only eaten by those animals that have been brought up on it, the hay is relished at once by horses, &c.

All oxen and horses require to be taught to eat the green Tagasaste, and once they learn they relish it for ever after.

The way Dr. Victor Perez made Tagasaste hay was that called the Burgundy method in France. Small heaps were made of the twigs and they were stirred about till, after a few days, they got cool, and then it was all placed in a stack and not given to horses or cattle till fully three months had elapsed.

Is Tagasaste Poisonous ?

Dr. G. V. Perez says that it is absolutely incorrect to say that Tagasaste is poisonous. "From time immemorial all the horses, cattle, &c., in our little island of Palma have been brought up on Tagasaste almost exclusively,

Fig. 1.--Tagasaste (*Cytisus proliferus* var. *palmensis*).

On Tagasaste

Fig. 2.—Escobon de Canaria (*Cytisus proliferus* var. *Canariae*).

On Tagasaste.

without any harmful effects. At the end of his French pamphlet about Tagasaste you will see that Professor Cornevin, of Lyons, who was the greatest authority on poisonous plants, reported very favourably on it, and he did not succeed, even with huge doses of the extract made from the seed, in poisoning any animals. None of our Canary Islands Cytisi are poisonous, like Laburnum (*Cytisus Laburnum*)."

Dr. G. V. Perez is a highly educated man, an M.D. of London.

Notes from South Africa.

In the *Agric. Journ. of Cape of Good Hope*, May, 1907, p. 591, the Cape authorities speak diffidently about it, saying, "Tagasaste can only be recommended for cautious trial by those interested," and asking for further information from correspondents competent to give it.

The above request elicited a reply in the issue of July, 1907, p. 4. It is an admirable account by Mr. J. M. Orpen, who was not only an old South African resident, but one who lived in Teneriffe for nine months, and who studied Tagasaste on the spot under Dr. V. G. Perez' guidance and also independently.

He combats South African prejudice against it, which is really based on scanty knowledge of the plant.

He points out that in Cape Colony it thrives near the sea level at Capetown, and near Tokai, and near Johannesburg, in the Transvaal, at 6,000 feet, and at intermediate and wide apart places and altitudes, showing its great adaptability to various climates and soils.

Following are points in his really valuable paper, the best I have read in English :—

No experiment whatever appears to have been made in South Africa in regard to its being really cultivated and used for fodder, as it is in Teneriffe. It has been said : "We have got good lucerne ; why go further? We want a crop to reap easily with a sickle and machinery. Who wants a *tree* for such purposes. . . . I shall first say that I do not suggest that Tagasaste is to be used to compete as a fodder plant with lucerne on the same soil—though as a testing experiment they may be tried under the same conditions—but to grow without irrigation where lucerne cannot be grown well as a crop.

Mr. Orpen then proceeds to describe what he saw in Teneriffe.

The Tagasaste was introduced from the small mountainous island of La Palma to Teneriffe by Dr. Victor Perez, the father of Dr. G. V. Perez, who now follows his father's footsteps by cultivating it largely.

In his original experiments he let the plants grow as they liked for three years and then cut them down to 3 feet, by which long, soft, succulent shoots were produced. At first his horses and cows would not touch it, but "he starved them into submission. Ever after they were greedy for that food. They throve on it." . . . "With the aid of the greatest authority on animal feeding in France he introduced Tagasaste there and in Algeria, and, after thorough testing, that authority gave judgment absolutely in favour of it."

In Teneriffe it is also grown as an ornamental tree, or to produce honey.

Where Mr. Orpen first saw the pollarded Tagasaste bushes in bearing was at an elevation of about 1,200 feet, "on a place that did not seem to me to be suitable for ordinary lucerne. It was on a convex, rather steep slope of a hill. All the soil in Teneriffe—where there is any, for it is very stony—is volcanic. This special soil seemed much like dry red brick-dust, and not deep. *There is no irrigation thereabouts.* Springs are scarce; none were near. There is seldom more than 10 inches rainfall per annum, and little dew."

"I threw shoots to a sow with a lot of little pigs. They all rushed it and devoured it. In the very large cowsheds and stables I saw plenty of cows, horses, and mules

feeding on Tagasaste. In stacks and barns I saw plenty of it, just like lucerne, and smelling wholesome. There, at all events, it has proved a conspicuous success. It pays well. The questions are 'Why,' and again 'Why should it not be tried and succeed elsewhere?' The burden of condemning such trials would rest with the opponent, and be a heavy one."

Mr. Orpen then proceeds to explain the geological formation of Teneriffe, and how the rock and soil hold and distribute the water.

In the *South African Agricultural Journal*, Vol. 5, p. 131 (1913), it is stated that "ordinary lucerne is more worthy of attention, even on dry lands," but no evidence is adduced.

I am quite aware of the progress that has been made in regard to the selection of varieties of lucerne for non-irrigable lands, but I believe I am putting the case fairly when I state that the above remarks are guesswork.

Notes from Australia.

In the Kew Report of 1879 it will be seen that it was sent by Kew to Dr. Schomburgk, Director of the Botanic Gardens, Adelaide, in that year, and he raised numerous plants. *Kew Report*, 1880.

Brisbane Botanic Gardens (1880) reported unfavourably. The conditions were probably too humid.

Dr. Schomburgk (*Kew Report*, 1882) still reported favourably, and added that he received a few applications from South Australia, but a large number from the neighbouring colonies. He reported again in 1888 and 1889, and recommended it as a drought-resisting fodder plant.

Tagasaste was probably sent by Kew to the Sydney Botanic Gardens in this general distribution, and my predecessor probably grew it here and probably distributed some of it, but I have not seen any records of it, and annual reports were abandoned for many years.

Perhaps some seed of it got into circulation in New South Wales through Dr. Schomburgk, as already hinted; at all events the seedsmen sold it when asked for, which was not often.

Mr. G. Valder (*Agricultural Gazette*, New South Wales, 1896, p. 605) has an illustration and a note on experience of sixteen months at Wagga Wagga. He says: "It is a most valuable plant in times of drought, but I would not recommend it to be grown on a large scale as a forage plant."

In the *Gazette* for 1899, page 38, I quote Dr. Perez' testimony in favour of Tagasaste, and also that of Jared G. Smith, in his *Fodder and Forage Plants*, published by the Department of Agriculture, U.S.A., in 1896, which is distinctly favourable.

I have a brief note in the *Gazette* for 1908, p. 390.

That it will grow readily in Australia has been proved beyond doubt. In our own State it will flourish in the coastal districts, in the coldest parts of the Blue Mountains, in the northern and southern tablelands, and even on the western plains, but I do not know how far west.

What we want is to do anything we can to improve the stock foods in all parts of New South Wales, to render them more nutritious and more abundant. In this connection Tagasaste seems to present a *prima facie* case which should

Fig. 3.—Escobon de Tenerife (*Cytisus proliferus* var. *angustifolius*).

ON TAGASASTE.

Fig. 4.—View of an old Tagasaste hedge clipped regularly for many years. Teneriffe (Senor Benitez, photo).

ON TAGASASTE.

be followed up. It has never been fully tested either in Australia or South Africa, and if we can obtain a standby approximating in nitrogen value to lucerne, and yet capable of giving a return in areas in which lucerne simply will not live, we have made a step in advance.

But two things have to be borne in mind all the time :—

(1) Tagasaste must be pollarded and the young shoots fed to stock.

(2) Stock have to be taught to like it.

Neglect of these two matters seems to me quite to explain the comparative indifference with which Tagasaste has been viewed in New South Wales so far.

APPENDIX.

Where described—

1. "Tagasaste."
   Cytisus proliferus L. f. var. *palmensis* Christ (in Engler's *Bot. Jahrb.*, ix, 120, 1887).
2. "Escobon de Canaria."
   Cytisus proliferus L. f. var. *Canariæ* Christ (in Engler's *Bot. Jahrb.*, ix, 120, 1887).
3. "Escobon de Tenerife."
   Cytisus proliferus L. f. (perhaps the typical form) = *C. proliferus* L. f. var. *angustifolius* O. Ktze. (in *Revisio Generum Plantarum*, i, 178).

Key to the three varieties, and where they naturally occur—

1. Variety *palmensis* Christ. Leaves broad (length 2½–4 times width), most leaves pointed. (Otto Kuntze *loc. cit.*) From the Island of Palma.
2. Variety *Canariæ* Christ. Leaves broad, for the most part rounded at the apex. Generally a tall shrub or tree with many-flowered contracted inflorescences, or with short flower-bearing branches ½–3 cm. long. (Otto Kuntze *loc. cit.*)
   (*a*) *nanus* O. Ktze.
   Shrub ½–1 m. high, with leaves about half as large.
   (*b*) *laxiflorus* O. Ktze.
   Flowering branches elongated up to 1 cm. long.
   Var. *Canariæ* is from Grand Canary, wild, and also cultivated in rows. The form *nanus* is abundant between Cape Teno and Santiago, in South Teneriffe, and the form *laxiflorus* I have collected at San Mateo, in the Gran Canaria. Yet the normal form with tufted flowers is also abundant there.
3. Variety *angustifolius* O. Ktze. Leaves acuminate, narrow lanceolate, length 5–8 times the width. It is confined to Teneriffe, but there I have also often seen broad-leaved forms.

For the above notes, translated from Kuntze's *Revisio*, I am indebted to my assistant, Mr. W. M. Carne.

Sir Daniel Morris (*Kew Bulletin*, 1893, p. 116) describes var. *palmensis* as differing from var. *angustifolius* by its more robust growth and a laxer habit. It often attains a height of 12 to 15 feet in good soils, and all parts of the stem and branches are enveloped in leaves. In fact, its very leafy character is one of the marked features of the plant. The leaflets are ovate-oblong, somewhat obtuse, and dark-green in colour. The young are almost entirely destitute of the silky hairs so abundant on the species.

Note on No. 2, "Escobon de Canaria."—A note on the "ordinary Teneriffe plant, Escabon" (Escobon) is given by Sir Daniel Morris in the *Kew Bulletin* for 1893, p. 115. He calls it "Silky Cytisus," and gives a general description of it and its habitat.

Dr. G. V. Perez refers to this as "good fodder, but not so good as No. 1."

Note on No. 3, "Escobon de Tenerife."—This is of inferior value for fodder.

"It was my father who distributed Tagasaste seeds all over the world, and you may feel quite sure that the type-plant, which is known locally in Teneriffe under the name of Escobon, was never distributed by him. (The type-plant is very inferior as forage compared with Tagasaste.)"—Dr. G. V. Perez.

Sir Daniel Morris (*Kew Bulletin*, 1893, p. 115) refers to this "Escabon" (Escobon) as typical *C. proliferus*, and therefore did not give it a varietal name, as O. Kuntze afterwards did (of *angustifolius*). If this statement is correct, then var. *angustifolius* is surplusage.

Fodder Trees as a Resource in Time of Drought.

AN OFFER BY THE GOVERNMENT.

CONSIDERATION has lately been given by the Ministers for Lands and Agriculture to a scheme for encouraging farmers and pastoralists to establish plantations of fodder trees, as some insurance against such serious losses among stock as have been suffered during the past few months. The value of such plantations hardly needs to be stated. Those pastoralists who, during the recent prolonged period of drought, were able to fall back upon such useful fodder trees as the Kurrajong and Mulga, have proved their immense advantage when pastures have failed.

The scheme provides that the Government will supply, free of cost—other than freight—plants of such trees as the Kurrajong, Carob Bean, Tree Lucerne, and Native Salt Bush; these being considered the best for the purpose, having regard to the climatic conditions. It is not intended, however, to confine attention to these trees, and any others approved by the Forestry Department may be included. The utility and value of such plantations, however, would be very limited were the trees simply planted and left to take their chances. Cultivation and regular attention are essential to their proper growth, and in order to infuse a spirit of emulation into a work that, in a few years, may become a highly important feature in Central and Western Districts, where grazing industries are liable to the losses connected with prolonged droughts, it is proposed to make available a sufficient sum to provide prizes for the best plantations.

Suitable plants for the purpose will be granted free of cost—other than freight—to any persons desirous of establishing such fodder reserves on their holdings, subject to the following conditions:—

(1) In quantity sufficient to plant not less than 1, or more than 10 acres, at 20 feet apart on each holding;

(2) The sites for planting to be securely enclosed with stock and vermin-proof fencing, and to be ploughed to as great a depth as possible;

(3) The planting to be performed under Government supervision and direction;

(4) Three months' notice, prior to the 1st May in each year, to be given of intention to plant, and the sites to be prepared for planting not later than that date.

(5) A sum of £150 to be expended every three years from the afforestation votes to provide prizes for the best fodder plantations established in the Central and Western Districts of the State.

Illustrative plots of fodder trees will be established on State Agricultural Farms in the various districts.

It should, however, be noted that no trees will be available for distribution until next planting season—that is about June, 1916.

An Earth Pit for the Destruction of Fly-infested Fruit.

A. T. HUNTER, Fruit Inspector.

A CHEAP and ready means of destroying fly-infested and other waste fruit is necessary in our orcharding districts. In the Dural and Kurrajong districts a pit is used, and has been found very satisfactory. The method, however, is not generally known, otherwise it would be more largely used.

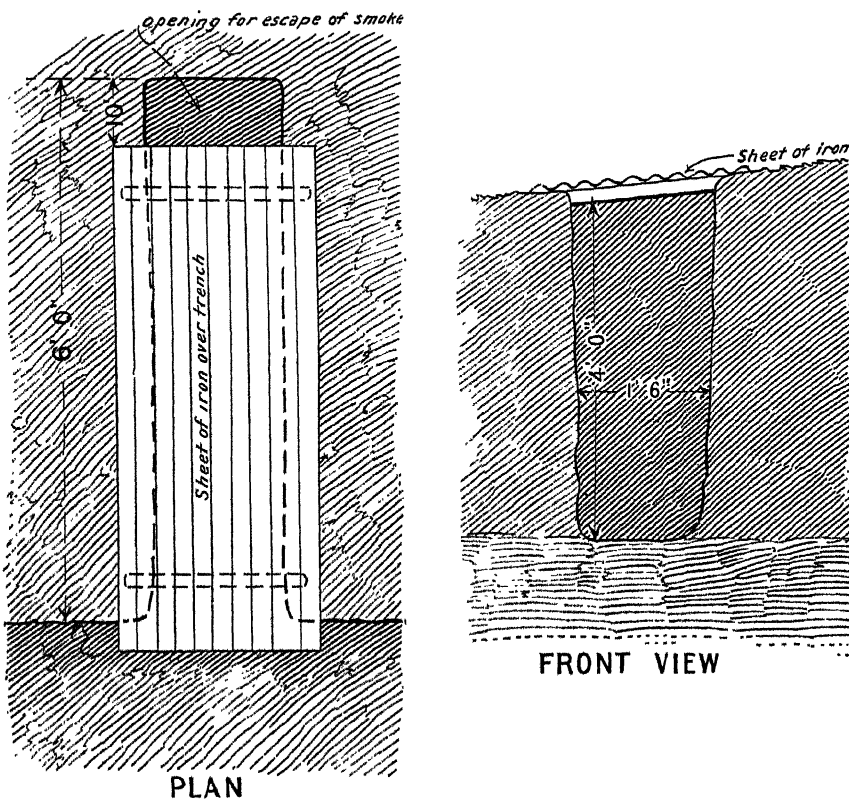


Fig. 1.—Plan and front view of pit for burning fly-infested fruit.

The "pit," or more correctly speaking, "trench," is dug about 18 inches wide for about 6 feet into the hillside or bank of a creek, and when possible about 4 feet deep. It is advisable to cover the top of trench with a sheet of iron, leaving a space about 10 inches wide at the rear end for the exit of smoke. A fire is made in the bottom of the trench, and the waste fruit is filled in from the top.

In places where the ground is rather level, and it would be difficult to obtain a site suitable for a trench of the type shown, a trench after the pattern of a "military fire trench" can be used to advantage. The great advantage of the trench method of burning is economy of fuel, which is a great consideration in some of our orchard districts, where firewood is becoming scarce, and a great saving of labour as compared with the primitive method of burning in open heaps.

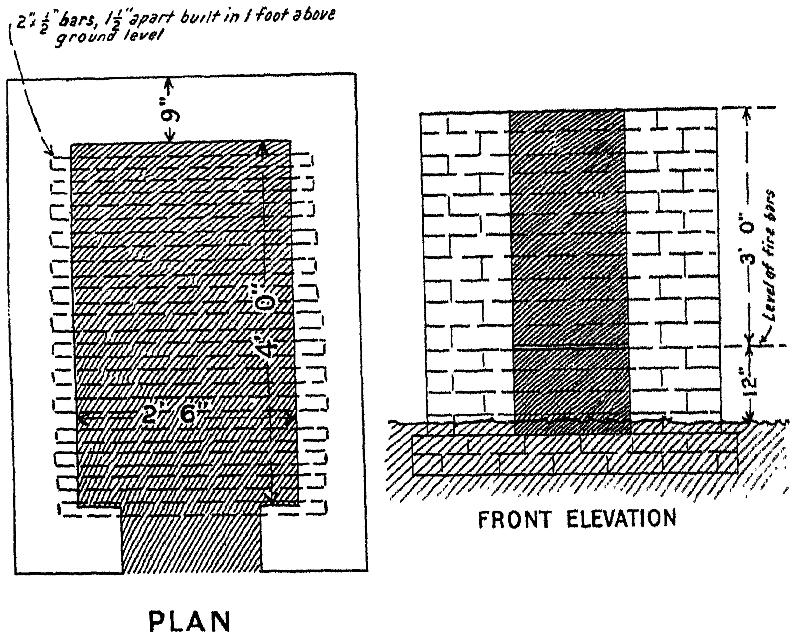


Fig. 2.—Plan and front elevation of a brick incinerator for fly-infested fruit.

The type of "built" incinerator, shown in Fig. 2, is used in some places; it is simple of construction and effective, and can be built of brick, stone, or concrete, and could be erected by any handy man.

The sketch shows one built of brick, 4 feet by 2 feet 6 inches inside, and 4 feet high. Iron bars are built in about 1 foot above the ground level. The fire is made under the bars, and the fruit is loaded in above the bars. An incinerator of these dimensions is large enough for a good sized orchard.

This type is very effective in the case of summer fruit, which becomes very sodden, and deadens the fire when it comes in immediate contact with it.

The approximate cost of an incinerator of these dimensions would be about £5; the price would, of course, vary somewhat according to facilities for obtaining materials.

Poultry Notes.

JAMES HADLINGTON, Poultry Expert.

OCTOBER.

WITH a return to something approaching normal conditions in regard to feed supply, poultry-keepers will now be able to resume normal methods of feeding. Doubtless, some lessons have been learned as a result of the high prices that have ruled during the past twelve months, but it is doubtful whether anything has been found either more economical or as satisfactory as the universally recognised methods of feeding with pollard, bran, wheat and maize. Poultry-keepers who have followed the advice given in these notes and otherwise in regard to hatching as usual this season, and who also made an early start, can confidently look forward to being able to make up some of the leeway. A little optimism in times of adversity is always wise, and particularly so when one has had experience of a similar nature, which in the end has proved, as in this case, less disastrous than was expected. But it is doubtful whether the most optimistic amongst us were prepared for so favourable a turn in the prospects of the industry at such an early date. With bran and pollard now at slightly over 1s. per bushel, wheat and maize coming within reasonable distance of normal, new-laid eggs ruling at 1s. and over per dozen (which, it may be noted, is probably the lowest price they will reach this spring), instead of 9d. or 10d. as is usual at this time of the year, and table poultry realising almost unprecedented prices, the position cannot but be regarded as satisfactory.

The opinion expressed by Mr. George Valder, Under Secretary and Director of Agriculture, when addressing the poultry conference at the Hawkesbury Agricultural College in June last, that poultry-keepers were in for a good time, no doubt appeared to many unduly optimistic; but it now appears to be within measurable distance of realisation. The importation of wheat has materially assisted to bring about cheaper poultry feed in all lines much earlier than would have been possible without it, because it has enabled millers to start and thus lead to the production of pollard and bran.

Single Pens in the Laying Competition.

Competitors in the Hawkesbury Laying Competition generally will welcome the approval given by the Minister for Agriculture (the Hon. W. C. Grahame, M.L.A.) for the building of 420 single pens, to enable single hen testing to be carried out there on a scale not previously attempted anywhere. True, it is not every breeder who will be able to secure pens or even wish to do so, and some might not make the best use of the tested hens if they had them; but it should form the basis of a good deal of careful work on the part of our poultry-breeders who have the necessary skill and opportunity to do so, and

who cannot carry out the testing themselves. The advantages to be derived from the fact of each competitor receiving the individual tally of each hen, properly identified, are obvious. It will also demonstrate in the most effective manner to what extent drones and unprofitable sorts generally may be carried on any farm, and will be an educative factor in the necessity for acquiring the art of selection, and thus exercise an important bearing on the poultry industry as a whole.

The Hatching Season.

Fortunately many poultry-keepers have "hatched as usual" and commenced early, but many others have not, on account of what was considered a poor prospect. These would do well not to attempt to catch up by unduly prolonging the hatching season and thereby rearing flocks of late chickens. By the time these notes are read all this season's chickens should be hatched out. In view of the more favourable prospects, the temptation to prolong the hatching can be well understood; but such operations can only prove unprofitable. The reason for this, together with what might be done as a catch-crop at a later date where table poultry is required, was fully stated in Seasonable Hints for Poultry-keepers of last year.

Care of the Chickens.

It is one thing to hatch chickens, but another to rear them; greater skill is necessary to rear than to hatch. Chicken-rearing has been dealt with in previous notes, but some reminders are seasonable. The chicken is susceptible to changes unfelt by other animals, and fairly uniform warmth is absolutely indispensable; at the same time, coddling them too much is productive of trouble. Pure air will do more to lower the mortality experienced in rearing chickens under poultry farming conditions than anything else, but this fact is apparently too simple to be appreciated at its true value by some operators, and the tendency is to look for disease instead of faulty conditions as the source of the trouble. It might be emphasised that close stuffy brooders literally starve the chickens in respect of oxygen. Deficiency in this vital element means stunted growth and weedy and ill-conditioned chickens, and they lack the robust constitution necessary to enable them to resist disease and make them into thrifty birds that should respond adequately to the feed expended upon them.

Thousands of brooder chickens that have been used to heat are ruined by being taken from it too suddenly and at too tender an age. The safest course is to harden them off before removing them from heat altogether and five weeks is quite early enough to put them out, except in hot weather. Cosy quarters should be provided, and they will thrive better if split up into batches of fifty or even less.

Making the most of Cockerels.

Most egg farmers would welcome any suggestion that would enable them to hatch all pullets and no cockerels, but, since that is impossible, the question of how to make the most of the 50 per cent. of males that must be expected in normal hatchings, is a question that will appeal to all. A majority of egg

farmers will aver that little or no profit is made from the cockerels, and in many instances a loss is incurred. It is quite possible that better acquaintance with market conditions in regard to the supply and demand for different classes at various periods of the year, and also with the conditions under which they are sold, might put a somewhat different complexion upon this weak spot, and assist towards the realisation of profits. In the spring right up to November almost any class of poultry makes good prices; this is simply because there are so few being sent in. The hatching season proper has not produced large quantities up to this time, and especially is this the case with what are known as broilers. These are plump chickens, eight to twelve weeks old, which at this time make prices which appear out of all proportion to their weight; but these are as much a luxury as any other product coming early in season. But as the weeks pass, the supply of these increases enormously. Partly as a result of the high prices that have been ruling for these sorts, and the progress of the hatching season, when December is reached there is a plethora of this class, prices have slumped as a result, and there is said to be a glut. This there certainly is, but not of the class demanded, because the settled policy of many egg farmers is to quit their cockerels as early as possible, being under the impression that they do not pay to keep longer.

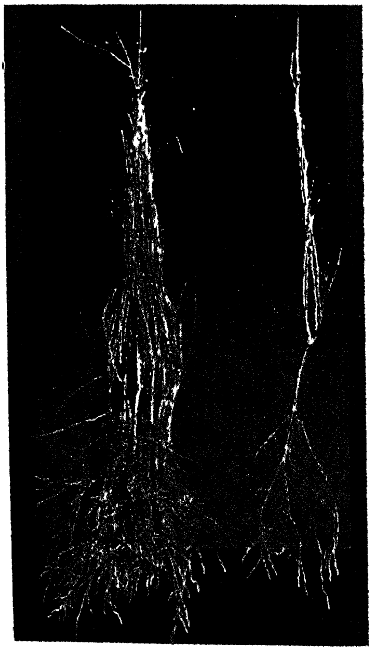
In a paper, entitled "Cost of Production," read at the 1914 Poultry Farmers' Conference, held at the Hawkesbury Agricultural College, I showed that this idea was erroneous, and with feed at normal rates, even White Leghorn cockerels of the prolific laying sorts, can be made to return a profit, if kept to the right age and weight, and marketed when they are ready, and not when the breeder wants them off his hands. In other words, the cockerels must be treated as a product to be marketed with a view to profit, and not merely as a by-product of the egg farm. Breeders, instead of pursuing this policy should watch the seasons and markets more closely. As prices for the class mentioned recede, which they generally do early in November, instead of continuing to market large numbers of this class, they should, as far as practicable, under their own conditions, keep them longer with a view to making them into a more weighty class of table poultry, at, say, 4½ to 6 months of age, for which there is a steadier demand, and which would also materially increase were a good supply available. I refer here, of course, to all breeds, but even the White Leghorn should not be despised as a table fowl when brought to 5 months and over (weedy and very light sorts excepted). Several times last year during the plentiful months, January to April, on several occasions I saw White Leghorn cockerels, whose ages would be between 5 and 6 months, sold at over 6s. per pair in the markets, and these are not unusual prices. Other breeds sold from that figure up to 8s. 6d. per pair. It must be obvious that under normal conditions these are paying prices, but the whole question resolves itself into ages and weights to suit requirements; if these were properly regulated gluts would be unknown, trade would be enormously increased, and poultry farmers make appreciably more profits.

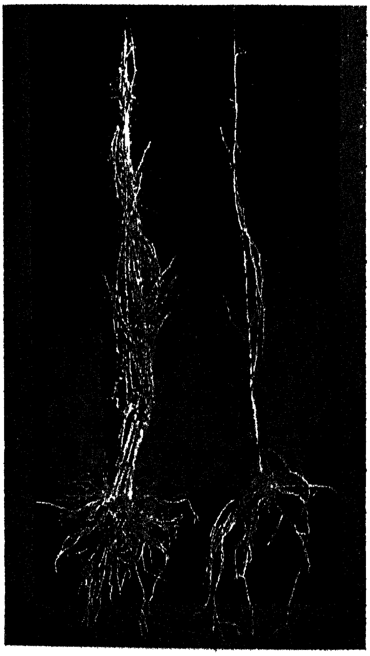
1

1 Specimen Graft, one-year old, showing first season's growth.

2. Bundle of Mourvèdre x Rupestris No. 1202 ungrafted rootlings, one-year old.

3. Bundle of Grafts, one-year old.





SPECIMENS OF GRAFTS AND ROOTED

Agricultural Bureau of New South Wales.

NOTES COMPILED BY H. ROSS, Chief Inspector.

SINCE the commencement of this movement in 1911 highly satisfactory progress has been made, as will be observed on reference to the long list of country branches shown at the conclusion of these notes, and on perusal of the notes of meetings of the various branches published herein from time to time.

The main objects of this organisation are to impart agricultural education to farmers by means of lectures and demonstrations by departmental officers, and to encourage farmers to assist one another by gathering together regularly and exchanging their ideas and experiences, principally as regards local conditions, and, of course, regarding agriculture generally.

Farmers are invited to join the local branch, and can do so by getting into touch with its honorary secretary.

In districts where no branch exists, farmers are asked to co-operate with the Department in endeavouring to establish a branch. Full particulars regarding the usual method of procedure, &c., will be furnished on application to the Under Secretary and Director, Department of Agriculture, Sydney.

Notice to Honorary Secretaries.

It is important that regular monthly meetings should be held, and that a record of the meetings of the branches should be inserted in the *Agricultural Gazette*. Honorary secretaries are invited to forward to the Department a short account of the proceedings of each meeting, with a brief summary of any paper which may have been read, and the discussion that followed it, as early as possible after each meeting. Notes for insertion in the *Agricultural Gazette* must reach the Department before the 14th to ensure insertion in the following month's issue.

Insect Pests.—Quite a number of the branches have availed themselves of the Department's offer to supply a set of the common insect pests of the district, and collections are cased as required. The Government Entomologist suggests that as each district has certain pests peculiar to its orchards and gardens, more useful work would be done if the members themselves collected the local pests (orchard, garden, and stock) and sent them to the Department, where they would be arranged, mounted, a descriptive label attached, and returned to the branch. Mr. Froggatt considers that such a collection would have a far greater value, as there would be more interest attached to the specimens when the members knew exactly where the pests came from, and where and how to find them.

Sheaves of Grasses.—The Department is prepared to supply to branches of the Bureau which make application through their secretaries, collections of sheaves of grasses considered suitable for the respective local conditions.

Formation of Libraries.—It is suggested that each branch should arrange to establish a library for the use of members; it is thought that this would be a capital way of expending surplus funds.

Secretaries of any branches which may decide to form a complete library are invited to communicate with the Department in the matter, and they will be furnished with an appropriate list of standard works.

Each branch when formed is supplied with a set of available *Farmers' Bulletins*, and from time to time new bulletins are sent to the secretaries for addition to the files. In addition to this, individual members can also procure copies of any bulletin or publication that may be of interest to them in their particular branch of rural industry, by applying for the same through the secretary of the local branch.

Organisation of Branches.

An officer (Mr. A. M. Makinson) has been appointed especially to attend to the needs of branches of the Agricultural Bureau, and generally to organise this movement.

He will visit in turn every branch throughout the State, and confer with the secretaries and members as to future operations, &c.

Secretaries will be advised in due course when this officer will pay a visit to their respective districts.

Demonstrations in Clearing Land and Subsoiling with Explosives

A limited number of demonstrations in clearing land and subsoiling with explosives will be given by Mr. C. W. Burrows, Assistant Inspector of Agriculture, to branches of the Agricultural Bureau. Branches who wish to take advantage of this offer are requested to make early application to the Department through their honorary secretaries.

Bee-keeping.

A series of lectures on bee-keeping is being arranged by Mr. R. G. Warry, Instructor in Apiculture. Secretaries, whose branches intend availing themselves of this opportunity to receive a practical insight into this branch of agriculture, are requested to make early application.

Lessons of the Drought.

A suggestion which is worthy of consideration has been made by the Secretary of the Wolseley Park Branch, to the effect that branches of the Bureau throughout the State should set apart a meeting for the reading and discussion of papers by members on "Lessons of the Recent Drought."

It is thought that discussion on the subject will be of permanent benefit to those farmers who may have bitter experiences to relate.

Branch secretaries might well introduce this matter to members, and invite them to prepare papers.

The Department will be glad to receive copies of such papers and reports on the discussions.

REPORTS AND NOTICES FROM BRANCHES.

NOTE.—While gladly publishing in these columns the views of members of the various Branches of the Agricultural Bureau, it is pointed out that the Department does not necessarily endorse all the opinions expressed.

Albury.

Mr. H. C. Stening, Inspector of Agriculture, delivered a lecture on growing cereal crops for grain and hay before the members of the above branch at Thurgoona on 23rd August.

At the conclusion of the lecture questions were invited from the audience, some of which are here given with replies thereto:—

Question.—What is the strength of lime water used in connection with pickling of wheat?

Answer.—Lime water contains only a small fraction of lime in solution, one part of lime being soluble in 700 parts of water. To prepare lime water 1 lb. of freshly-burnt lime should be mixed with 100 lb. (10 gallons) of water, and after being agitated well allowed to settle. The clear liquid is the lime water, which may be decanted off for use. When all of this has been used more water may be added to the lime that has settled and more lime water thus prepared.

Question.—Would it harm if, when the lime is mixed with the water, the white liquid were used?

Answer.—When lime is held in suspension in the water it is known as "milk-of-lime," and if seed is immersed in this it may subsequently interfere with the passage of the seed through the force-feed of the drill.

Blacktown.

The monthly meeting took place on 7th September. It was decided to write to the Railway Commissioners intimating the willingness of the branch to assist in beautifying the local railway station grounds.

Another lecture on the Murrumbidgee Irrigation Scheme has been arranged for 23rd October. Mr. Tolley will be the lecturer.

Two new members have joined the branch.

Bloom Hill (O'Connell).

The following is a *resumé* of a paper read by Mr. William Downey at a meeting on 21st August:—

STRAWBERRY GROWING.

Strawberries would grow in almost any soil, but the best was a sandy loam, as water at the roots would kill the plants. It was of utmost importance to plant the right sort in the right place. A northerly or north-easterly slope was best. The ground should be broken up to a depth of 12 to 15 inches. If this was done just before planting a good dressing of lime was beneficial, as it sweetened the soil; well rotted stable manure was also good. The plants should be put in rows 3 to 4 feet apart, with 1 foot between each in the row. When the runners started to grow they could be turned in on to the row, where they would take root and form a matted row. Some growers made the rows 12 to 15 inches wide, but in this district he found the berries had a better flavour when grown in narrow rows. The finest and best flavoured fruit were those that ripened in the sun.

When the sun was very hot, it would sometimes scald the fruit, but that did not often happen in their climate. It was a good plan to place some short straw or chaff along the row early in the spring, to keep the berries off the ground. It should be done just as the leaves started to grow. Most growers took only two crops off and then turned the growth under and put in fresh plants. Only the strongest plants from the runners should be kept for planting.

Questions.—In reply to questions, Mr. Downey said he had taken four crops off the same plants, and could see no difference in the quality of the fruit. July was the best time for planting in that district—later planting was risky. He had not tried Queensland varieties, but had found Melba, Cresswell, King Edward, and Royal Sovereign successful varieties. Manure should be well dug in. Strawberries would not do well in clay soil.

At the same meeting Mr. Harris read a paper of which the following is a summary:—

POTATO CULTURE.

Any land of fair quality would grow potatoes, but those from a chocolate soil had the best appearance. The land should be very well prepared before the seed was sown, and the sets placed about 5 inches deep in order to protect the crop from the attacks of the potato moth. When the crop was about 3 inches high it should be hilled with a Planet Jr. horse hoe, or similar implement, but no further cultivation should be given. Once a farmer had obtained a variety of potato that suited his particular locality, and one that met the requirements of the consumer, he should not change his seed, but should select it from his own crop, while the potatoes were being dug. A beginner had to obtain seed to start with, and a good way would be to obtain a small quantity of three or four of the best sorts. These should be sown in separate plots, in order to ascertain which was the most suitable, and the best kind should be retained for future sowing. Satisfaction and Early Rose were good sorts for either early or late crops. His best crop of early potatoes was sown about the middle of June, and his best late crops had always been planted early in December. He was very careful to select his seed in the paddock, but he had been growing Satisfaction for about sixteen years without changing his seed, and had never had a failure. When he selected his seed he treated it with a weak solution of Bordeaux mixture, and when dry covered it over in order to keep out the light as much as possible until sowing time. Medium-sized seed was the best, and each potato should be cut lengthwise, but care should be taken to have the seed sown immediately after it had been cut. Three feet between the rows and 18 inches between the sets, gave a good result for table potatoes, but if grown for the Sydney seed merchants the rows should be about 2 feet apart. Providing the price was reasonably good, the best way was to forward the potatoes from the paddock immediately after being dug, thus saving much subsequent labour. In country districts the public schools might be able to establish experimental plots of potatoes, and thus help in the solution of the problem of the best variety to grow in various localities.

DISCUSSION.—In the discussion which followed the reading of his paper, Mr. Harris stated that Irish Blight was a fungus disease, and the best means of combating it was to spray the growing crop with Bordeaux mixture. The disease would remain in ground where an affected crop had been grown. He thought it safer not to cut late potatoes—his practice was to plant whole or to cut in two lengthwise, and he believed in rubbing off all sprouts. He had found sowing potatoes with sprouts produced irregular crops. Hilling was a good idea if done when the plants were very young—just over the ground—but it had an injurious effect when plants got over a certain height, 3 or 4 inches, as it disturbed young growth. He had got best results with Satisfaction and Early Rose varieties. He had found "pitting" the best method of keeping potatoes in good condition. Potatoes in bags lost weight and sprouted more quickly.

Brocklesby.

A branch of the Bureau was established at Brocklesby at a meeting held there in the early part of September. There are twenty members to commence. Mr. J. A. Hogan was elected Chairman, and Mr. James Hunter Hon. Secretary and Treasurer.

Canadian.

The monthly meeting of this branch was held on 27th August, when a general discussion took place on farm matters, some interesting points presenting themselves.

The Secretary reports that (1) the impression seemed to be that big harvesters cannot take off a heavy crop—say, 40 bushels per acre; (2) it was more economical, and a greater crop could be harvested, by using several sets of horses to each machine; and (3) in the event of a shortage of farm labour, the crops could be taken off by co-operation.

At the next meeting, Mr. C. Smith is to read a paper on use and misuse of farm implements.

Cardiff.

A lecture on fruit culture was delivered by Mr. J. G. R. Bryant, Assistant Fruit Expert, to members of the above branch on the evening of 20th August last. The hall was crowded, and the hearing was an enthusiastic one.

Carlingford.

"Some Impressions of Tasmania, Agricultural and otherwise," was the subject upon which Mr. D. K. Otton (Hon. Secretary) read a paper at a recent meeting of this branch. The following paragraphs give some account of orchard methods as he saw them :—

Impressions of Fruit-growing in Tasmania.

Mr. Otton described Tasmania as the land of apples. They are to be seen growing everywhere, and they seem as much at home in back yards as in well-kept orchards. There is a marked contrast between the Tasmanian orchards and those in the Cumberland district and some other parts of New South Wales. Great attention is paid to the pruning of the trees in Tasmania, to ensure the fruit being borne on the main limbs. Everywhere are seen trees the main limbs of which are laden with apples right from the tips to within a few inches of the ground. So heavily do the trees bear that bud pruning or thinning out of the fruit is systematically carried out. Bandaging and spraying with arsenate of lead are both adopted for combating codlin moth, though only the former is compulsory.

Manuring, principally with bonedust, is carried out in most of the orchards. The greatest drawback the fruitgrower has to contend with is the uncertainty of the weather. He never knows when a severe frost will deprive him of his crop, and frosts are likely to occur right up to November. A great deal of windy weather is also experienced.

The great advantages possessed by Tasmania over the other States lie in the superior keeping quality of the fruit produced and in the cost of production, which, in the case of apples, can be kept down to 2s. per case, so that anything obtained in excess of that margin represents profit. This low cost of production is possible, because the quantity of apples produced per acre is so high, the carriage of the fruit to Hobart is mainly by water, and also because, owing to the splendid wharf accommodation, transhipment to the mail and interstate steamers can be effected with the minimum of handling. As a matter of fact, it is only a matter of lifting the cases of fruit from the steamer that brings them from the orchard on one side of the wharf into the vessel in which they are exported on the other side. During the season about 40,000 cases of apples and pears are sent to Sydney every week. Another factor which tends to cheapen production, and ensure a steady return to the fruitgrower, is the almost limitless capacity of local factories for all kinds of fruit Another standby of the apple-grower is the cider factories.

The fruit on apricot trees is also confined to the main limbs, which are covered with fruit from top to bottom.

Whilst apples, pears, and stone fruits give the largest return per acre, they also involve a lengthy period of waiting until the orchard comes into bearing. The small fruits—raspberries, black and white currants, strawberries, and gooseberries—are very largely grown, because they give a quick return. Raspberries, however, only give the best results when grown in a patch surrounded by forest trees, as they need shelter. The bulk of the raspberries comes from the Huon district.

Cobbora.

At the last meeting, held on 4th September, a paper was read by Mr. R. Thompson on agriculture as a science. The paper really took the form of a lecture, and will be followed from time to time until the whole subject has been treated. The points touched on in this first paper included—importance of a knowledge of principles of agriculture, plants as living things, fertilisation of seed, germination, definition of soil, warmth of soils, conservation of moisture in soil, bare fallows and fallow crops, and the real objects of tillage. A discussion of this paper will be the business of next meeting.

Collie.

The monthly meeting was held on 27th August, when one new member was enrolled.

A discussion took place regarding the worst weeds of the district, and it was concluded that the following were the worst in the order given, namely: Prickly Pear, Bathurst Burr, Tobacco Plant, Castor-oil Plant, Saffron Thistle, Darling Pea, and Goose Foot. All other weeds were considered to have some feed value.

Coobang.

At a meeting of this branch on 20th August, a paper was read by Mr. Benno Seidel on working the fallow.

Working the Fallow.

Mr. Seidel, having indicated that it was for each farmer to select for himself the cultural methods that best suited his own soil and climatic conditions, proceeded to remark that there are two ways in which nature improves the soil—frost in winter, and the sun in summer, and two main methods by which farmers subjected their soils to those agencies—the long fallow and the short fallow.

Taking the long fallow first, he assumed that the ground had been ploughed during the winter and left in its rough state till the fullest benefits of the frosts had been obtained.

The paper continued:—The ground should then be cultivated, preferably with a spring-tooth cultivator, to the full depth that the land has been ploughed. There are four conditions of soil particles deserving special attention, namely, dust, granules, crumbs, and clods. If the object is to prepare a good seed-bed, as it should be, then these particles should be placed—the dust on the bottom, then granules, then crumbs, and finally the clods on top. Whether this arrangement is obtained, depends largely on the skill of the operator and the implement used The advantage is that the soil is not so easily caked as with a fine surface. The cloddy surface is what should be aimed at, first, to secure a good seed-bed, and, second, to conserve moisture. The spring-tooth cultivator is, in my opinion, the only implement on the market that will place the particles of soil in their proper relative positions. Every farmer who has worked a spring-tooth cultivator will have noticed that the tines are always bringing the clod and crumbs towards the surface. Consequently, any finer particles trickle in between, and form the sub-surface soil or seed-bed. Our objective should be the cloddy surface; and assuming that it has been obtained, we have the best seed-bed both for receiving rains and also for retaining the moisture that has been received.

Now that the fallow has received its first working, the seed-bed has been prepared, and should not be disturbed. But we know further cultivations will have to take place, as warm weather is sure to germinate weeds, and these, if unchecked, will rob the soil of a certain amount of moisture. These should be coped with in their infancy, before they have taken too much moisture out of the subsoil. Weeds are also harder to get rid of once they have properly established themselves. Different weeds require different machinery to eradicate them once they get to an advanced stage. If we take our own district into consideration, well out on top comes the black oats and mustard weeds in the winter, and the wild melon in the summer.

In lands where black oats and mustard weeds are prevalent, the only effective method of eradication is by fallowing and working the fallows to encourage germination and to eradicate before seeding. If they are allowed to seed, it means they have robbed the soil of nourishment required for the coming crop, and have spread their seed over the area ready to germinate with the crop. If it is possible to cultivate while the weeds are young, a spring-tooth cultivator will suffice, or if the surface is loose, a set of well sharpened and weighted harrows will often do the job more effectively and quickly, but the latter implement can only be adopted when the weeds are but a few days old.

When new land is being fallowed for wheat growing, it should be ploughed with the mould-board plough, as there is usually a fair amount of grass on new ground, and the mould-board plough will turn it under. In most cases new land will turn up in a sod, and to put a spring-tooth cultivator on to such land for the purpose of preparing a seed-bed, would be inadvisable. A better method would be to run a one-way disc or some other disc implement over it, and set it so that the discs run straight, or nearly so. If there is not sufficient weight in the implement itself, it should be weighted. A good

method for putting extra weight on to an implement is to make a butt of earth and place it on that part of the implement where it is most required. By these means the sod can be cut up and a satisfactory seed-bed prepared. The disc has also the advantage that it does not turn up the grass again, which consequently decays much quicker and becomes humus.

The wild melon always appears during the summer months, when all attention has to be paid to garnering the crops, and when the fallows cannot receive the attention they should. The melon is one of the worst weeds for robbing the soil of moisture. In my opinion it takes more moisture out of the soil than many realise, and it is essential to deal with it before it is too far advanced. Once the vines commence running, the best implement is the one-way disc. If given the full set, it will be quite effective, but the working should be shallow.

In South Australia, where the average rainfall is less than in our district, fallowing and cultivation of the fallow is very necessary to ensure a crop. The scarifier-harrow, as they call it—invented by a farmer—is being used to a greater extent in the working of the fallows than any other implement. The scarifier-harrow is built on the stump jump principle. Instead of the tines being pointed like the ordinary harrow, they are drawn out to a shovel-like point, being about 2 inches in width. These are heavy harrows, a set of four being ample for six horses to work. These harrows act similarly to a scarifier, breaking up a crusted surface, and tearing up any weeds, unless too firmly established. They have the advantage that they do not disturb the seed-bed. These harrows were recognised as the best implement for working fallows some ten years ago, and should be well suited for the working of fallows in this district.

In the opinion of a good many farmers in the Lower Riverina, the scarifier holds its own against any other implement for working up fallowed land. The scarifier of latest design will deal effectively with weeds, even in their advanced stages. These scarifiers are made both set and stump jump, and my advice to anyone going in for a scarifier is to get a stump jump, even if his land is well cleared, as these take the ground as well as the other class. My surprise is that the scarifier is so rarely seen in this district.

When time will not permit the fallows to be worked, sheep should be turned on to keep the weeds down and prevent them from seeding. This system, which a fair number adopt, has its advantages as well as its disadvantages. Science has taught us that sheep return to the soil, as manure, 75 per cent. of what they consume, and as they get the wool, some farmers consider it a good proposition. But sheep, when constantly on fallow, tread the surface down hard, and then only a few weeks of summer weather are required before there is very little moisture left.

For the short fallow, land should be ploughed up during summer and left in its rough state for the sun to penetrate. After the first good fall of rain, the land should be cultivated with a spring-tooth cultivator. Any further cultivation required on summer fallows can be well left to the farmer's own judgment. If weeds appear there should be further cultivation, but all such cultivations should be shallow, so as not to disturb the seed-bed.

Under natural conditions, the rain that has been absorbed by the soil is afterwards brought to the surface by capillary attraction, and unless protected from the action of the sun and wind will be lost by evaporation. In the kitchen garden we can prevent this by covering the surface with rotten straw or stable manure, but on a wheat farm this practice becomes impossible. Fortunately, loose dry soil acts in a similar way. If the top soil is kept loose and dry by cultivation, it acts as a covering for the moisture-laden soil beneath. For this cultivation, the best implement is undoubtedly the harrow. The harrow, though one of the first implements to be constructed, still holds its own for conserving moisture in our fallows, providing it is used at the right time.

We have had dry years, and have learned the value of fallowing, but there are three factors which I should like to repeat: Fallow so that the greatest advantage may be derived from natural agencies; cultivate to prepare a seed-bed; and work the surface so as to prevent evaporation.

Coradgery.

At the invitation of the Coradgery branch, Mr. J. Wrenford Mathews, Sheep and Wool Expert, paid a visit to Coradgery on 17th August, and gave a demonstration and address to a number of farmers.

The Farmers' Sheep.

The demonstration was given at Coradgery woolshed, where Messrs. Balcombe Bros. had yarded a number of sheep, both of Merino and British breeds. The various points and types suitable for the district were discussed, the breeding of the plain-bodied Merino being advocated, and breeders were advised to aim at a wool of good character

and length of staple. Shape and conformation were also taken duly into account, it being pointed out that constitution should be sought before excellence as regards wool. No matter how good the wool might be, unless the sheep possessed well-formed frames they could never be considered true specimens of the type. For local conditions he favoured the well-known Wanganella Merino. The Government had established a stud for supplying the small breeders of New South Wales with this well-known and singularly adaptable type. This stud had been established at Trangie, where 7,000 acres were to be devoted to sheep breeding.

Breeders were advised to practice a regular system of culling and of classification of ewes before mating. This was necessary, as many of the good qualities of the type were lost by the haphazard methods of mating followed by many breeders.

After luncheon, Mr. Mathews delivered an address on the question of cross-breeding. The experiments conducted by the Department, and the results to date, were summarised. It was pointed out that the Lincoln and Merino lambs were somewhat late in maturing, and consequently the lambs were not as far advanced at the weaning stage as some of the earlier breeds. He considered that the best age for marketing the Lincoln was from 18 to 24 months, and it would perhaps pay to take two years' wool off the sheep before marketing, in view of the fact that, while developing the sheep were producing a very profitable class of wool. For five-months lambs he preferred the Border Leicester to the Lincoln. The Border Leicester cross was also a very valuable one at the ten months stage, at which it could be marketed as a weaner. In fleece value the Border Leicester cross was slightly less profitable than the Lincoln, but what it lost in wool value it made up in weight of flesh, and hence in value of carcase. Regarding the use of crossbred ewes, he favoured the Down breeds. Excellent results had been obtained from the Dorset Horn. Crossbred ewes should not be mated as early as pure Merinos. His experience went to prove that the crossbred was a shyer breeder than the pure Merino. The crossbred ewe seldom came into breeding condition before January, and should not be mated before the middle of that month. It was advisable to yard the ewes overnight during the mating period, and where lambs (suckers) were the objective the ewes should be adequately fed. Crossbred ewes would raise a better class of lamb from Down rams than either Border Leicester or Lincoln rams from the Merino ewe. This econd cross produced a bigger lamb, of better quality than the first long-wool crosses. When crossbred ewes were used, however, an increased food supply was necessary, and the natural pastures should be supplemented by the growth of fodder crops. He thought the prospects of lamb-raising at Coradgery were excellent, and he strongly recommended the growing of fodder crops. The risk of using second crosses was that a number might be left on the farmers' hands past the weaning stage, but this could be easily overcome by the provision of a more efficient food supply. The crossbred sheep was the farmers' sheep, and was the right type for the combination of wheat growing with sheep raising.

The monthly meeting of the branch was held at Mr. H. H. Balcombe's, on 21st August.

Mr. J. Clatworthy read a paper on the question of cutting and stacking a portion of the grain crop.

Harvesting with Reaper and Binder.

Mr. Clatworthy said all were agreed on the value of straw stacks, especially after the experience of last season. The question was asked, why not have a reserve of hay, but when hay was selling at, say, £6 to £8 per ton, it was not economical to feed it to store stock, when straw with the addition of molasses would give equally good results. Straw could be termed a by-product, because the grain had been obtained with very little extra expense as compared with the harvester or stripper. Personally he considered there was almost as much difference between good and inferior hay as between threshed straw from a crop cut a little on the green side and straw gathered in the field after the harvest. He recognised that this year there were two difficulties in the way, firstly, the shortage of labour, and secondly, the fact that all farms were depleted of hay, and that they would need to conserve an extra large quantity. On the other hand, there never had been a better opportunity of securing good straw, on account of the prolific growth of the crops, and there was also the probability that the railways would be unable to move the grain in reasonable time, and the wheat would be as well in the secured stack as lying in bags on the farm or at the sidings. By threshing time also, there would be the possibility of securing cheaper bags, an item which alone would pay a portion of the extra expenses incurred It was only by co-operation that they could ensure the presence of a threshing plant in the neighbourhood.

DISCUSSION.—The discussion centred largely on the cost of wheat from the harvester and of that from the threshing plant. The following was Mr. S. Plowman's estimate :—

Cost of Cutting and Threshing 100 acres of Wheat on basis of 4-bag crop.

	£	s.	d.
Four bales twine at 33s.	6	12	0
Cutting 100 acres at 3s.	15	0	0
Stooking at 1s. 3d.	6	5	0
Carting and stacking 15 tons a day ; 3 men at 10s. each per day ; 1 team at 6s.	12	12	0
	£40	9	0
5-feet thresher, 800 bushels a day (machine owner finds 2 men) ; 12s. per 100 bushels	7	4	0
Eleven men, 10s. per day	8	5	0
	£55	18	0

Or a little over 11d. a bushel.

Mr. G. TANSWELL considered the straw could be secured in the stack for £1 1s. a ton.

The principal points in favour of threshing a portion of the grain crop, as brought out in the discussion were :—

The harvest work is better distributed, and less risk is run by having a portion of the grain crop secured against losses from storms.

A slightly increased yield, estimated at half a bushel per acre, and a better quality of grain.

Reserves of straw stacks secured at a moderate cost. The land is kept cleaner, and is ready for fallowing at any time, there being no straw or stubble to contend with.

Against the practice were placed the greatly increased cost, and the shortage of labour, which this year would practically prohibit any but the quickest methods of harvesting

The annual picnic was held recently, and proved a great success. The net proceeds amounted to £32, and the whole of this was devoted to the funds of the local Red Cross Society.

Coraki.

At a meeting of this branch on 10th August, Mr. Ralph Warby delivered a very interesting address on the question of cane-growing, dealing especially with the varieties that had come within his own experience as a grower.

VARIETIES OF SUGAR CANE AND THEIR CULTIVATION.

Mr. Warby brought a number of samples to the meeting, and touched briefly on the merits of each.

D 1,135 (Demerara) was a great frost resister, a big stooler, and a good cow cane, for it had little fibre and was soft. It was a 2-year-old cane, and sent out from fifty to sixty stalks to the stool on suitable land.

Mahona was a good, soft cane with a hard skin, familiar to every cane-grower.

Innes 115 was a splendid 1-year-old variety ; one of the best sugar-canes, fairly soft, had a good top, and was a noted frost resister. It was a new cane, and not much of it was yet in evidence on the Richmond. It was very fibrous, perhaps too much so for cattle.

New Guinea 23 Black, a very big stooler and good rooter ; did not grow much the first year, but in localities unaffected by frost it was a particularly fine cane. It sent out up to sixty or seventy stalks to the stool. New Guinea (yellow) exhibited similar characteristics.

D 117, another Demerara. There being some doubt about the number it was usually called "Green." It was not a big stooler, but it was a big rooter, and eminently suited for stiff, clayey soils. It would thrive where Mahona would prove a failure, and show to advantage in the second crop.

Clarence (or Garvin) 16, another new cane, a big stooler, did not grow much in the first year. It belonged to the same family as No. 12, grew large tops, would flourish in poor, sandy soil, and grow where other varieties would prove a failure. This cane Mr. Warby grew on the worst portions of his land. If planted on rich soil it went down and broke off ; after a storm the crop looked as if a steam roller had been over it.

1900 Seedling—a cane with a big, cabbage-like top, possessing the virtue of growing upright again if it goes down in a storm. He had grown stalks with as much as 15 feet of mill cane below the top. It was, however, liable to Fiji disease, a soft cane, and not possessing much fibre.

Continuing, Mr. Warby said that most of the above varieties were suitable for cow canes, but primarily a man's land must decide what varieties he should grow. In swampy soil or rich alluvial Mahona was one of the best of canes, and in clayey soils along the river bank it would be hard to beat D 117; but to get the best results farmers should grow small experimental plots of each variety, and test for themselves what their lands were most suited to grow. As to the planting of cane, the result of his experience was that deep cultivation and light covering were essential. It was a mistake to cover the plants deeply; he had found that out to his cost. There should be just enough earth put over the plants with a hoe to nicely cover them. Sets thus planted would shoot a week earlier. Three or four eyes should be left on each set, and they should not be planted too closely—5 feet between the drills at least (6 feet was better), and not less than 4 feet in the rows. Cane should have room to spread and to stool, and for that reason the mistake of planting too close must be avoided. With a good, square paddock, plant the sets 5 feet on the square. The drills should be thrown up one way, then cross-drilled, and a set put at each cross furrow. The plant cane must be carefully cut to avoid injury to the eyes. The sets should be dropped in with the eyes on the side—not on the top. This would avoid injury to the eye when tramping with the foot after hoeing over the light covering of earth. The hoe was slower than a light plough for this work, but it was more effective, and the grower gained by the results

Another essential was to have the ground well drained. A good disc plough and a scoop were indispensable in this regard. He made it a practice to scoop out the headlands, and throw the earth back on the field. This had a triple effect—it banished weeds from the headlands, assisted in drainage, and gave an even depth of ploughing, and consequently a more uniform crop. They would often notice in farms how the cane petered out towards the headlands. That was because the plough ran shallow, but the judicious use of a scoop on the headlands prevented that. He attached special importance to drainage, and regarded it as an absolute necessity on low, flat land, if successful results were to be achieved. Wide, shallow drains he found to answer admirably, and they were easy to construct.

As to diseases, Mahona was the only cane, with, perhaps, the exception of some of the New Guinea varieties, that had proved itself free on the Richmond. The Fiji disease was very prevalent, and was going to prove a serious menace if care was not exercised. He exhibited various canes showing this disease in its early and late stages. It began by causing the top leaves to wither. If they cut these leaves with a knife, and took a microscope they would see certain congested cells, the congestion causing the leaves to stop growing, and wither away. The disease worked down into the stalk, the top of which gradually died, and a fresh shoot then shot out from the eyes. The disease in full-grown cane did not affect the milling quality. But no infected cane should be used for planting. If it were used, it would only put out a large number of withered, stunted stalks, which would not come to anything. Samples of these were shown. Moreover, if the disease were allowed to progress, the wind blew the infection on to adjoining cane stalks, and the trouble quickly spread. Rooting out and burning the affected stalks was the only remedy. So far as he knew 1900 Seedling and D 1,135 were more susceptible to this disease than any other canes.

In conclusion, he recapitulated the best advice he had to offer from practical experience—cultivate deeply, cover the sets lightly, and don't plant close and get spindly cane. If D 1,135 were planted wide it could be cultivated over a series of years. In hard, lumpy ground run twice in the furrows, in soft ground once. He would be glad to supply the Bureau with plant cane, in order to help along experimentation by farmers.

Mr. Hunt inquired whether shallow planting would not militate against germination except in moist weather. Mr. Warby said if the sets were covered they would stay in the ground for any length of time, and the light showers would start a growth, whereas they would not do so in deep planting.

In answer to other questions, Mr. Warby said Demerara should be a good cow cane. 1900 Seedling was a good cropper—84 tons to the acre had been grown on their land two years ago, for which they were paid 14s. per ton, clear. Rats were a great curse in the softer skin sweet canes, and he knew of no effective remedy. He exhibited a stalk which they had nearly bitten through. With the first wind all these stalks went down and rotted. Badilla did not flourish in this district.

A vote of thanks was accorded Mr. Warby for an interesting and instructive address.

Corowa

A new branch has been formed at Corowa, with twenty members to commence.

The office-bearers elected for the first twelve months were:—Chairman, Mr. W. R. Teague; Vice-Chairman, Mr. S. W. Thompson; Treasurer, Mr. John Chivell; Hon. Secretary, Mr. R. Dwyer.

Meetings are to be held on the first Thursday in each month, and the subscription fee has been fixed at 2s. 6d. per annum.

The next meeting will be held on 4th November.

Cumnock.

A public meeting was held at Cumnock on 8th September, when a branch of the Agricultural Bureau was formed. There are already twenty-eight members, and the branch should prove a strong one.

The following gentlemen were elected office-bearers for the first twelve months:—Chairman, Mr. James Eggleston; Vice-Chairman, Mr. J. A. Eggleston; Treasurer, Mr. W. J. Cahill; Hon. Secretary, Mr. S. R. Reynolds.

The subscription fee was fixed at 2s. 6d. per annum.

Cundumbul and Eurimbula.

The monthly meeting was held on 23rd August, when it was decided to make arrangements to stage an exhibit at the local show.

Members expressed appreciation of the fact that Farmers' Experiment Plots were about to be established in the district.

Dural.

At a meeting held on 23rd August a branch of the Agricultural Bureau was formed at Dural, with twenty-three members to commence.

The following office-bearers have been elected for the ensuing year:—Chairman, Mr. W. R. Hawkins; Vice-Chairman, Mr. J. W. R. Smith; Treasurer, Mr. W. Bradstreet; Hon. Secretary, Mr. H. E. Wickham.

Fernbrook.

The Secretary (Mr. W. Marks) reports that during the year just closed twelve meetings of the branch were held, and were well attended by members. Demonstrations given by departmental officers on the use of explosives in clearing, and the summer and winter pruning of fruit trees, were much appreciated. There was a credit balance of 10s. 3d.

At the annual meeting, held on 21st July, the following gentlemen were elected office-bearers for the ensuing twelve months:—Chairman, Mr. F. Sawtell; Vice-Chairman, Mr. W. English; Treasurer, Mr. W. Nutt; Hon. Secretary, Mr. W. Marks.

Forest Creek.

The annual meeting was held on 21st August, when the Secretary reported that seven business meetings had been held during the year. A picnic, arranged by the branch, was well attended and proved most enjoyable. The finances were in a satisfactory state, there being a credit balance of £3 16s., apart from the subsidy.

The following gentlemen were elected office-bearers for the ensuing twelve months:—Chairman, Mr. W. J. Prosser; Vice-Chairmen, Messrs. J. G. Chudleigh and G. Gay; Treasurer, Mr. C. F. S. Gee; Hon. Secretary, Mr. W. Thompson.

Keepit.

There was a good attendance at the meeting of members of this branch on 4th August.

The election of office-bearers for the ensuing year resulted as follows:—Chairman, Mr. Jas. Gardner; Vice-Chairmen, Messrs. E. A. Porter and H. V. Dowe; Hon. Secretary and Treasurer, Mr. J. B. Fitzgerald.

The Organising Inspector (Mr. A. M. Makinson) addressed the meeting on the aims and objects of the Agricultural Bureau, and the best methods of assuring the successful working of branches.

The regular monthly meeting will in future be held on the first Wednesday of each month at 2·30 p.m.

Kellyville.

At the last meeting of this branch, Mr. Daniel Kearney, the newly appointed Secretary, read a report on the operations of the past year. Nine monthly meetings had been held, and some very useful and instructive discussions had taken place. A lecture and a demonstration had been given by experts of the Department. A visit had also been received from Mr. A. M. Makinson, Organising Inspector. A long discussion on noxious weeds had taken place at two successive meetings

The year closed with fifty financial members, and a credit balance of £1 7s. 7d.

The election of office-bearers for the ensuing year resulted as follows:—Chairman, Mr. Howard Reid; Vice-Chairman, Mr. Joseph Nutter; Treasurer, Mr. Harry Firth; Hon. Secretary, Mr. Daniel Kearney.

Little Plain.

The monthly meeting was held on 26th August.

After discussion it was agreed that the following were the twelve worst weeds in the district:—Wire Weed, Pig Weed, Ram's Head or Calthrop, Saucy Jack, Castor-oil or Thorn Apple, Bathurst Burr, Noogoora Burr, Fat Hen, Hexham Scent, Couch Grass, Black Oats, and Variegated Thistle. It was the opinion of the meeting that a study of the habits and peculiarities of each weed was necessary before it could be eradicated or reduced in such a way as to be of little or no detriment to crops or pasture. Every effort should be used to prevent seeding by cultivating, feeding off, fallowing, hoeing, &c.

The following is extracted from a paper read by Mr. S. Leech at the same meeting :—

RAPE AS A FARM CROP IN THE INVERELL DISTRICT.

Rape will grow by simply working the ground with a spring-tooth or disc cultivator after burning off the stubble, and then harrowing the seed in. It is much better, however, to plough thoroughly for it as soon as possible after the wheat is off. Then in February, sow about 3½ lb. of seed to the acre If the crop is to be fed off with sheep, I should advise adding about 10 lb. of mustard seed to each cwt. of rape seed, as that prevents scouring. In an average season this crop will be ready to put sheep on in May, and between then and September, it will top up about ten sheep per acre if the season be a good one. A good plan is to turn on about six to the acre. These will be ready for market in six to eight weeks, and then after giving the paddock about a fortnight's spell, another three or four sheep per acre can be put on. The sheep fatten quickest if there is some grass land for them to run on when they like. It gives them a change and keeps their appetites up to the mark. Some people prefer to have rape in two paddocks and to change the sheep week about. This is a good plan, because it is not only a change to the sheep, but at the end of the week the first paddock has nearly recovered what it lost the previous week. There is no mistake about the fattening qualities of rape. If a sheep is sound, even if it is quite thin, it will quickly become prime, and will weigh more for its size than a sheep fed on lucerne or on natural grasses. It does not seem to matter about their age ; old sheep without a tooth appear to do just as well as others.

It must be admitted that in some dry seasons the seed will not germinate, but even then there is only the loss of the seed, and the ground benefits by the early cultivation which perhaps it would not otherwise have received.

The most profitable use for rape is to feed sheep on it. It is a surer way of manuring the ground than simply ploughing in, and there is the additional profit on the sheep. I have never known sheep to "bloat" on rape, in fact, sheep do not take very readily to it at first, and I suppose that is why I find they can be turned on with safety. Generally speaking it may be noticed that a lot of wheat that has been lost from the stripper comes along with the rape, and the sheep always take that out first. Then they gradually take to the rape, and if they are on it long enough they will even paw its roots out.

A paddock that has grown rape and been fed off, ploughs up in excellent order, and keeps in a nice friable state throughout the season.

DISCUSSION.—Mr. HOBBS asked at what rate did Mr. Leech sow rape seed per acre?

Mr. LEECH said he sowed 3 lb. broadcast, and harrowed it in. His experience taught him that a light sowing was preferable as it ensured larger and more robust plants which stood unfavourable weather conditions much better.

In reply to other questions, Mr. LEECH said, if sown in February rape was generally forward enough to commence feeding off in May. From eight to ten sheep per acre could be fattened if put on in poor condition. "Station culls" generally gave the best monetary return.

Lower Portland.

A paper, from which the subjoined paragraphs are taken, was read by Mr. W. C. Gambrill at the July meeting of this branch :—

SEASONABLE WORK ON THE FARM.

The present season, winter, is considered by most farmers the slack season, but in reality it is the time of the year when the prudent and ambitious man can devote time to his property in the way of building or renewing fences, barns, and buildings of all necessary kinds, clearing scrub lands, and improving the farm in many and various ways. It does not follow that during all this time the land must be neglected. On the contrary, it should have previously received its autumn or winter ploughing, during which process as much of the summer grass and weeds as possible should have been turned under and allowed to rot. Where there is a heavy coat of grass to turn in, a heavy chain hung on the front of the plough or on the swingle-tree and allowed to drag in the furrow will effectually pull in an ordinary crop of summer grass. If this method is practised, a good supply of vegetable matter is added to the soil, whereas, if the rubbish is burnt off, as i often done, the land must become s(much the poorer.

Pruning.—This is a matter deserving more attention than it generally receives. The citrus trees, although not requiring as much attention in the pruning line as the deciduous fruits, should be overhauled each year, and any dead wood and long shoots cut out. The stone-fruit trees, being such vigorous growers, require more attention. In the case of young orchards, it is an easy matter to go over a large number of trees and to do the necessary pruning in a very short time, but to go over the same number of trees when they are 10 to 15 years old is quite a different matter. Hence the usual neglect of pruning. Nevertheless, it is a profitable operation if judiciously carried out, for a smaller quantity of superior quality fruit requires less time and is easier to handle, and always gives a satisfactory account of itself in the market, while, on the other hand, inferior fruit, especially in large quantities, is unsatisfactory to both consumer and producer.

Spraying and Fumigating.—The time has arrived when both spraying and fumigating are necessary. There are now so many different kinds of diseases and pests in the fruit world that it is almost impossible to produce good fruit without such artificial aids. For citrus trees I prefer the fumigation, and have proved its efficacy beyond doubt. The operation is slower, perhaps, and more costly at first, but if the result is better, then the extra cost is certainly the best. In the case of very large trees—that is, trees over 18 feet in height—the tents are a costly item, and if a very large number would have to be done, it would be as well, perhaps, to resort to the spray pump, for trees of this size and age are not so apt to take diseases. In spraying, it is necessary to see that the pump is in good order and not leaking anywhere, and that the spray is applied as fine as possible. Lime-sulphur and the miscible oils give satisfactory results if carefully mixed and applied. But with both spraying and fumigating great care must be exercised, for if too much of the ingredients are used the results will be drastic, while if too little is used it is only a waste of material and time. Search carefully all apple and quince trees for Codlin moth. Just as the early bird catches the worm, so the early searcher catches the Codlin moth grub—that is, if he is there to be caught.

Packing and Marketing Fruit.—The marketing of fruit is, or should be on a well laid out orchard, a seasonable operation practically all the year round, commencing with the early stone-fruit in the spring and continuing with the later varieties of peaches. apricots, plums, &c.; then quinces and apples almost up to the time when the early varieties of oranges and mandarins are ready to go, and as some varieties of oranges, especially on the higher lands, will hang till September, there is no reason why there should not be marketing all the year round.

The packing and grading of the fruit is an important factor, and too much care cannot be exercised in this respect. It is not so much the matter of grading for size (although two sizes of fruit should not be packed in the same case), but grading for quality. Personally, I prefer to be packing two cases at once, and have often found myself packing three and even four cases at the one time—packing, perhaps, two cases of the same sized fruit, but of quite distinct quality.

Manuring.—Having had the orchard previously worked up and in a good state of tilth, the manures may be applied at the present time or as soon as possible, sowing the bone-dust or other artificial mixtures immediately round the trees up to within about 18 inches of the barrels. Where farmyard manure is procurable it should be applied, for it is certainly the most economical of all manures, and at the same time it tends to replace in the soil all that has been taken out. When the manure is applied, the soil should be well stirred up with either plough or harrow, so as to thoroughly mix the manure with the soil, thus enabling it to give the best results.

The usual monthly meeting was held on 30th August, when a paper on "Farm Life" was read by Mr. R. M. Smith, and a spirited discussion of the subject followed.

Matcham.

A branch of the Bureau was formed at Matcham, near Gosford, on 21st August. The annual subscription was fixed at 2s. per member, and it was decided to hold the regular monthly meeting on the Saturday night on or before full moon.

The following gentlemen were elected office-bearers for the ensuing year:—Chairman, Mr. Geo. Pritchard; Vice-Chairmen, Messrs. A. D. Lockwood, T. R. Michelsen, J. Heath, and Geo. Piper; Hon. Secretary and Treasurer, Mr. W. R. Crossland; Auditors, Messrs. A. D. Lockwood and J. Anderson.

Milbrulong.

This branch held its annual meeting on 18th August, and office-bearers were re-elected as follow:—Chairman, Mr. J. H. Rogers; Vice-Chairmen, Messrs. F. Gollasch, J. Gleeson, and E. Hoffman; Treasurer, Mr. F. W. Gollasch; Hon. Secretary, Mr. O. Ludwig.

Miller's Forest.

The monthly meeting of the branch was held on 26th August, when the results obtained from the maize seed supplied last year by the Department were the subject of discussion.

The seed was grown on Mr. John O'Brien's farm,—five varieties, viz., Red Hogan, Boone County, Leaming, Yellow Dent, and Funk's Yellow Dent, being sown in rows 363 yards long and 3 feet apart. The crop had not what could be termed a good season, and about February a very severe, hot, dry time set in and almost burnt it off, until a fall of rain at the end of that month revived it. The cobs were harvested in May, and yielded the following weights of grain:—Red Hogan, 85 lb.; Boone County, 140 lb.; Leaming, 144 lb.; Yellow Dent, 110 lb. Funk's Yellow Dent was a complete failure, the seed having been very musty when sown. There appeared to be no better variety for the district than Leaming, which is small and weighty. Boone County is also a good variety, but the core appeared to be rather big.

Moruya.

The meeting of this branch, held on 1st September, was addressed by Mr. R. N. Makin, Inspector of Agriculture.

Mr. Makin said the Department had been conducting experiment plots at Moruya for a number of years, and he had made a point of noting how the farmers had cropped their land. He observed that in many cases there had been a continuous succession of maize on the same land, and he strongly advocated the adoption of a rotation.

The cultivation of lucerne would prove of the greatest importance to the dairymen. The district was suitable, as had been demonstrated on the two plots conducted by the Department, one on hilly land and the other on flat land.

Farmers were strongly urged to go in for ensilage, as in a dry spring like the present a sufficient supply of good ensilage would pay for the cost of a silo in a few months. The crop he recommended for the purpose was maize, but it should be harvested at the proper time, for if allowed to harden in the grain, as was often the case, the stalks were too ripe. The farmer should not expect to use the grain for the pigs, and then to get good ensilage by chaffing the stalks.

Stockinbingal.

The monthly meeting was held on 28th August, when fallowing and conservation of moisture were the subjects discussed.

Mr. A. Gilmour promised to read a paper on hay-making and stack-building at the next meeting.

Tallewang.

The regular monthly meeting was held on the 4th September. After the transaction of formal business, a paper on co-operation among small farmers was read by one of the members.

Co-operation among Small Farmers.

The directions, in which it was pointed out that co-operation could be practised in the district, were :—

(1) Making some arrangement by which prompt delivery of goods would be taken, instead of allowing them to remain at the railway station exposed to the weather.
(2) He thought that it would be highly satisfactory if comparative tests were made by local farmers of the different strengths of bluestone to use in pickling, as the results obtained by individual farmers themselves would be more impressive.
(3) The provision of a veterinary outfit suitable for use in dealing with urgent treatment of sick animals.
(4) Members might contribute a small amount monthly to purchase a complete chest of tools, which could be kept on hand for the use of contributors.

The above suggestions were merely made as a basis for a beginning. The system of co-operation could be extended subsequently.

A discussion also took place regarding the various methods of eradicating rabbits, and the consensus of opinion was that netting was essential to success.

Taralga.

The monthly meeting was held on 2nd August, Mr. John P. Quinn presiding.

The noxious weeds of the district were discussed, and it was considered the following list embraced the most troublesome :—Sorrel (easily first), Fat Hen, Bracken, Cobbler's Peg, Stinking Roger, Iron Weed, Dock, Star Thistle, Burrs, Black Thistle, Horehound, and Sweet Briar.

Temora.

The annual meeting of this branch was held on 7th August.

The report of the Secretary showed that the membership was twenty-three. Ten meetings had been held during the year, and several most valuable papers and discussions had taken place. Arrangements had been made, in consequence of one of these papers, to obtain from the farmers of the district an indication as to the best variety for local conditions, by taking the actual results obtained in the field. The forms dealing with the harvest of 1914-15 had already been received and subjected to systematic analysis by the Chairman, but on account of the abnormal drought conditions that prevailed, the branch considered that it would be misleading to take last season as in any way a representative one, though taken in conjunction with, say, two succeeding harvests it might have some value.

The balance-sheet showed there was £1 15s. 1d. cash in hand.

The following officers were elected for the ensuing year :—Chairman, Mr. W. de Little; Vice-Chairman, Mr. Dahlenberg; Hon. Secretary and Treasurer, Mr. J. T. Warren; Programme Committee, Messrs. W. de Little, J. H. Mallinson, J. T. Warren, and T. Reynolds.

It was resolved that the branch meet on the second Saturday in each month.

United Peel River (Woolomin).

Mr. N. J. Foster read a paper on general farming at the monthly meeting held on 11th August. He gave the meeting the benefit of his opinion as regards the cultivation methods with which the best results would be obtained in the district with wheat, maize, and lucerne. A short discussion followed an interesting paper.

At the meeting held on 1st September, a paper, from which the following paragraphs are taken, was read by Mr. O'Neill:—

WEEDS OF THE FARM.

Briefly, we may arrange weeds for practical treatment into (1) such as can be left alone, being of no special account, as in grass land; (2) such as we must and do keep down by cultivation; and (3) such as, for some reason or other, are specially noxious. In eradicating weeds, we need to note whether they are annuals or whether they live longer than a year. In both cases prevention of seeding will reduce or finally kill them out. Applications of arsenite of soda (1 lb. in 1 gallon of water) kills most weeds; salt in boiling water, or boiling water alone, for succulent plants can also be used.

Pulling up Paddy's Lucerne every season before seeding is effective. Sulphate of iron (1 lb. in 1 gallon of water) will kill green leaves and many plants. In chipping hardy perennials, care should be taken to cut below the crown. Speaking generally, weeds should not be allowed to seed. Judicious burning may be resorted to at times, and rotation of crops will keep many in control.

Attention to pastures should include regard for this question as a whole, more especially where noxious plants—Wild Carrot, for instance—are spreading with such ill effects on the butter industry.

Bathurst Burr.—Burrs depreciate wool; are good for nothing, hard to exterminate, injurious to grazing paddocks, and a great nuisance.

Nut Grass or Pig Nut.—Bad in cultivated land, a great robber of plant food, impossible to exterminate, will grow through and spoil potatoes.

Thistles.—Several varieties are useless and spread rapidly. At times thistles take complete charge of well grassed land.

Docks.—Slightly taint milk, almost unkillable, and useless for stock.

Sorrel.—Useless, difficult to eradicate, very persistent and rapid in growth, and chokes crops.

Balm or Stagger Weed.—Useless, dangerous to stock, and causes weakness in working animals.

Saucy Bob, Chinese Burr.—Spoils hay.

Wild Carrot.—A milk-tainter of the worst kind.

Blue Top or Cobbler's Peg.—Strong grower, smothers grass, and useless for fodder.

Johnson Grass.—Injures crops and difficult to eradicate.

Cat's Head.—Stock will not touch it.

Paddy's Lucerne.—Although stock will eat the tops, this is a bad weed in grass land.

Dandelion.—Said to produce stringhalt in horses, smothers grass.

Sweet Briar.—Monopolises grass land, and difficult to get rid of.

Blackthorn.—Monopolises grass land.

Dodder.—A lucerne destroyer.

Oil Tree.—Poisonous to stock.

I think it would be a good plan to have a collection of local weeds forwarded to the Government Botanist for classification, so that we should have a clearer and better understanding as to what weeds are valuable or of use, and what are otherwise detrimental.

Yurrunga and Avoca.

The usual monthly meeting was held at Avoca on 14th August. Mr. Geo. Ragg was appointed Hon. Secretary, in succession to Mr. W. H. Waters, resigned.

On 17th August Mr. J. G. R. Bryant, Assistant Fruit Expert, conducted, at Mr. F. Cunningham's orchard, Yurrunga, a winter pruning demonstration, which was much appreciated by those present. The officer demonstrated the different treatment required for varieties of apples, cherries, peaches, and other stone fruits. He also gave instruction on methods of grafting, and indicated the best varieties of fruits to grow in the district.

LIST OF BRANCHES.

Branch.	Hon. Sec.
Albury	J. Brann, Racecourse Rd., Albury.
Baan Baa... ...	P. Gilbert, Baan Baa.
Balldale	H. Elrington, Balldale.
Bathurst	J. McIntyre, Orton Park.
Batlow	L S. Chandler, Batlow.
Beckom	Peter Grant, Beckom.
Bimbaya	E. T. Boller, Bimbaya.
Blacktown ...	R. H. Lalor, P.O., Seven Hills.
Bloom Hill (O'Connell.)	C. A. McAlister, Bloom Hill, O'Connell.
Borambil	H. A. D. Crossman, "Homewood," Quirindi.
Brocklesby ...	J. Hunter, Brocklesby.
Bungalong ...	G. H. Pereira, Cowra Rd., via Cowra.
Canadian	F W. Taylor, Canadian Lead.
Cardiff	John Cockburn, Cardiff.
Carlingford ...	D. K. Otton, Carlingford.
Cattai	A. J. McDonald, Cattai, Pitt Town.
Cobbora	Robert Thomson, Cobbora.
Collie	C. J. Rowcliff, Cow Plain, Collie.
Coobang	Benno Seidel, Coobang, via Parkes.
Coonabarabran ...	H. H. Moss, Coonabarabran.
Coradgery ...	J. Clatworthy, Millpose, Parkes.
Coraki	G. E. Ardill, Bungawalbyn.
Coreen-Burraja ...	———
Corowa	R. Dwyer, Corowa.
Courangra ...	S. H. Warland, Courangra.
Cowra	E. P. Todhunter, Cowra.
Crudine	F. W. Clarke, Crudine.
Cumnock	S. R. Reynolds, Cumnock.
Cundletown ...	S. A Levick, Roseneath, Cundletown.
Cundumbul and Eurimbla.	J. D. Berney, Eurimbla, via Cumnock.
Deniliquin ...	W. J. Adams, jun., Deniliquin.
Dubbo	T. A. Nicholas, Dubbo.
Dunedoo	V. A. Florance (*pro tem*), Dunedoo.
Dural	H. E. Wickham, Dural.
Erudgere	Frank Hughes, Erudgere.
Fairfield	H. P. Godfrey, Hamilton Rd., Fairfield West.
Fernbrook ...	W. Marks, Yarrum Creek, Dorrigo.
Forest Creek ...	W. Thompson, Forest Creek, Frogmore.
Garra & Pinecliff	A. S. Blackwood, Garra, via Pinecliff.
Gerringong ...	J. Miller, Gerringong.
Glenorie	F. A. Nicholson, Glenorie.
Grenfell	A. A. Patterson (*pro tem*), Grenfell.
Gunning	E. H. Turner, Gunning.
Hay	F. Headon, Booligal Rd., Hay.
Henty	L. Eulenstein, Henty.
Hillston	M. Knechtli, Hillston.
Inverell	W. A. Kook, Rock Mount, Inverell.
Jerrara	A. O. Lane, Mullengrove, Wheeo.
Jindabyne ...	Sylvester Kennedy, Jindabyne.
Katoomba ...	W. E. Perry, Victoria Road, Katoomba.
Keepit, Manilla...	J. B. Fitzgerald, Keepit, via Manilla.
Kellyville... ...	Daniel Kearney, Kellyville.
Kenthurst ...	J R. Jones, Kenthurst.
Lankey's Creek (Jingellic.)	G. J. Nichols, P.O., Jingellic.
Leech's Gully ...	G. R. Smith, Homestead Farm, Leech's Gully.
Leeton	A. V. Roux, P.O., Leeton.
Little Plain ...	F. S. Stening, Little Plain, via Inverell.
Lower Portland	W. C. Gambrill, Lower Portland.
Mangrove Mountain.	A. E. Lillicrap, Mangrove Mountain, via Gosford.
Martin's Creek	P. Laney, Martin's Creek, via Paterson.
Matcham ...	Geo. Piper, Matcham, via Gosford.
Meadow Flat ...	F. J. Brown, "The Poplars," Meadow Flat, via Rydal.
Middle Dural ...	A. E. Best, "Ellseleigh," Middle Dural.
Milbrulong ...	O. Ludwig, Milbrulong.
Miller's Forest	A. J. O'Brien, Miller's Forest.
Mittagong ...	H. F. Thresher, Mittagong.
Moruya	P. Flynn, Moruya.
Narellan... ...	G. J. Richardson, Narellan.
Narrandera ...	James Falkner, Narrandera.
Nelson's Plains	M. Cunningham, Nelson's Plains.
Nimbin	J. T. Hutchinson, Nimbin.
Orangeville ...	C. Duck, Orangeville, The Oaks.
Orchard Hills (Penrith.)	H. Basedow, Orchard Hills, via Penrith.
Parkesbourne ...	W. H Weatherstone, Parkesbourne.
Peak Hill ...	A. B. Pettigrew, Peak Hill.
Penrose-Kareela	A. J. Bennett, "Brookvale," Kareela.
Ponto	A. D. Dunkley, Ponto.
Pyangle (Lue) ...	T. A. Sheridan, Homestead, Lue.
Redbank ...	J. J. Cunningham, Redbank, Laggan.
Ringwood ...	Wm. Tait, Ringwood.
Robert's Creek...	J. Cavanagh, Robert's Creek.
St. Mary's ...	W. Morris, Queen-st., St. Mary's.
Sackville	Arthur Manning, Sackville.
Sherwood ...	J. E. Davis, Sherwood.
Stockinbingal ...	J. Neville, Stockinbingal.
St. John's Park	J. C. Scott, St. John's Park.
Tallawang ...	Selwyn E. Hinder, Tallawang.
Tangmangaroo...	A. Thompson, Kangiara Mines.
Taralga	Dave Mullaney, Stonequarry, Taralga.
Tatham	J. J. Riley, Tatham.
Temora	J. T. Warren, Victoria-st., Temora.
Toronto	P. F. Newman, Toronto.
Tumbarumba ...	R. Livingstone, Tumbarumba.
United Peel Riv. (Woolomin.)	C. J. MacRae, Woolomin.
Upper Belmore River.	M. H. Hodgson, Upper Belmore River, via Gladstone, Macleay River.
Valla	A. E. T. Reynolds, Valla, via Bowraville.
Wagga	Thos. Fraser, Aberfeldie, Wagga.
Walla Walla ...	B. A. Smith, Walla Walla.
Wallendbeen ...	W. J. Cartright, Wallendbeen.
Walli	Geo. Edgerton, Applewood, Walli.
Wetherell Park	L. Rainbow, Wetherill Park.
Wollun	——— ...
Wolseley Park...	H. McEachorn, Wolseley Park.
Wyan	C. W. Harper, Myrtle Creek Railway Station.
Wyong	Edgar J. Johns, Wyong.
Yass	———
Yetholme ...	N. D. Graham, "Bona Dea," Yetholme.
Yurrunga and Avoca.	Geo. Ragg, Avoca.

Orchard Notes.

W. J. ALLEN.

OCTOBER.

Cultivation.

Now that the summer weather is commencing to be felt, cultivation should not be neglected. The soil around the base of all trees and vines should be loosened to a good depth with a pronged hoe. Whilst frequent stirring of the soil is necessary, it has to be borne in mind that at this season of the year thunderstorms frequently occur. In that case provision should be made to take away excessive surplus water. A light plough-furrow run through the row of trees after cultivation will serve the purpose. The land should be worked with spring-tooth cultivators as soon as possible after rain. Frequent working will assist in conserving moisture, and also keep the soil in the best condition to receive any rain that might fall. In conjunction with the cultivation of the soil for moisture-conservation is the application of a mulch for young trees. Well-rotted stable manure, straw, grass, &c., are excellent materials for placing around the trunk. The mulch should be placed just clear of the trunk, and be spread, whenever possible, over the area not covered by the cultivating implements.

Young Trees.

Where young fruit trees are planted in an exposed position it may be necessary to tie them to a stake to protect them from damage by wind. The stake should be placed in a sloping position below the crown of the tree so as to avoid rubbing.

Keep a strict watch on all refills and young trees, and if these show any signs of wilting, give them one or two buckets of water from time to time, until they are well established. Disbud all newly-planted trees, leaving at least three or four good shoots, about 4 inches apart, along the trunk of the tree. Do not allow two or three shoots to start from the same place, but give each branch a separate hold of the main stem.

In the case of young trees growing vigorously, and situated in a windy position, the thinning out should not be done too early, as the growth is soft, and the winds may blow the shoots completely off the stem. Trees under irrigation might have the tips of the young shoots pinched, so as to harden off the branch and permit of thickening and branching.

Codlin Moth and Other Pests.

The spraying of all apple, pear, and quince trees should still be carried out in conformity with the Fruit Pests Act. A high pressure pump is necessary for the best work. The trees should be well coated with spray. If possible, the hottest part of the day should be avoided for carrying on the work. Soft water is preferable for use in diluting the spray mixtures. The second spraying should be given for Black spot of the apple and pear as soon as the fruit is well set. Bordeaux mixture applied at a summer strength: Copper sulphate (bluestone), 6 lb.; lime, 4 lb.; water, 50 gallons, is suitable for the purpose and may be applied in conjunction with arsenate of lead. If lime-sulphur solution is used alone, the Department's formula, 53 lb. lime, and 100 lb. sulphur to 50 gallons water, should be used at summer strength, *i.e.*, a dilution of 1 part of the concentrated mixture to 28 parts of water.

While working around trees, watch for borers on the trunks and branches, as it is very easy when they are first commencing their work to cut away the bark and find them. In this way the orchard can be kept free of the pest.

The Pear and Cherry Slug pest will soon be making its appearance. Arsenate of lead will be found suitable for keeping it in check, and may be used at a somewhat weaker strength than for Codlin Moth—about 3 lb. to 100 gallons of water is sufficient.

Black and green aphis may give trouble this month among the peaches. Spraying with tobacco wash and soft soap, when thoroughly well done, will keep the pest in check. Two applications may be necessary.

Grape Vines.

Sulphur (flowers) should be placed upon the crowns of the vines, using about a dessert-spoonful for each vine; this is an excellent treatment for preventing the spread of oidium. When this fungus is prevalent, dusting may be necessary; bellows for the purpose may be used, and knapsack sprays are also found economical for applying the sulphur. In the event of rain, applications should be frequent. For Black Spot a late spray that will not discolour the fruit is necessary. For this purpose the Bordeaux mixture must be superseded by ammonio-carbonate of copper. Formula: 5 oz. copper carbonate, 3 pints ammonia, 45 gallons water.

Where the larvæ of the Vine Moth are present, the vines should be regularly sprayed with arsenate of lead (commercial form) at the rate of 2 lb. to 50 gallons of water.

Irrigation.

The first irrigation of the season should be given to all trees and vines this month. Therefore, see that furrows are well made, and that they are deep rather than shallow. While irrigating, see that no water is allowed to flow over the surface of the soil, nor lodge around the trunks of trees. When watering, give the land a good soaking, taking care to see that the water reaches the roots of all young trees and vines. Immediately the ground is

dry enough to work, it should be worked up to a good depth with suitable implements; the soil in the immediate vicinity of trees and vines should also be well worked up with a fork hoe.

Dormant Buds and Grafts.

Keep all worked stock well disbudded; never allow suckers to grow where either bud or graft is doing well. If the stocks on which buds were inserted have not been cut back, this should be done without further delay. The cut should be slanting, being slighter lower on the side opposite the butt; and it is advisable to stake them, not only to prevent their being blown out, but also to encourage a straight trunk.

Where grafts have been put in old trees, they must be tied to prevent them being blown off. To do this, a good stake should be tied to the branch grafted, and allowed to project a foot or more over the end; then, as the graft grows, it can be tied to it.

Pruning Citrus Trees.

Citrus trees may be pruned this month. Remember, this tree is an evergreen, and grows in the shape of a shrub. Thinning out should be carried on carefully, and only dead twigs and wornout shoots require removing. Shortening back, as in the case of deciduous trees, is not necessary. The tree is allowed to practically take its natural form. Old trees that are weak may be cut back hard, to force a new head. All the larger cuts should be painted with white-lead and raw linseed oil mixed into a paste. Thorny mandarins have a habit of bearing far too heavily one season, and very lightly the next. To ensure a more even crop each year, they should be thinned out freely when a heavy crop is showing on the trees.

The budding of citrus trees may also be done this month if the bark lifts well and the sap is running freely.

Thinning.

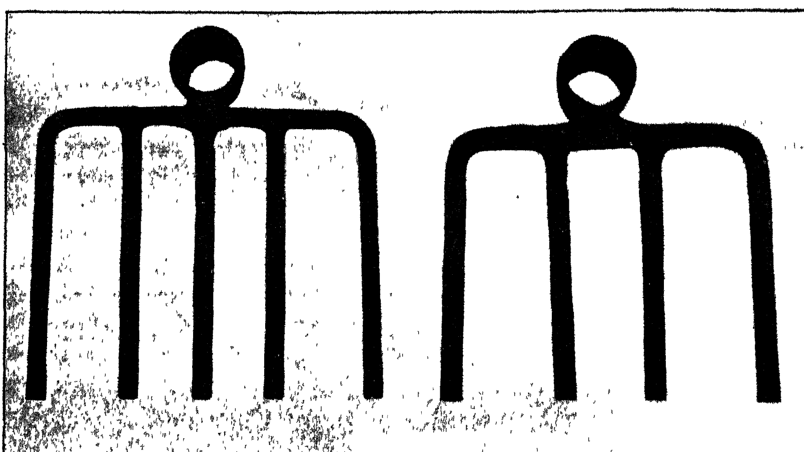
It is advisable to reduce the stone and pome fruit crops by thinning, wherever heavy crops have set. When the seed is hardening a natural drop of fruit occurs; but this is not always sufficient to ensure the trees carrying a crop of good-sized fruit. By thinning the fruit the grower removes damaged and insect-infected fruits, twins, and malformations. This ensures a better grade of fruit for market. The amount of fruit removed is determined by the variety and age of the tree, and also whether irrigation is practised or not.

Harvesting.

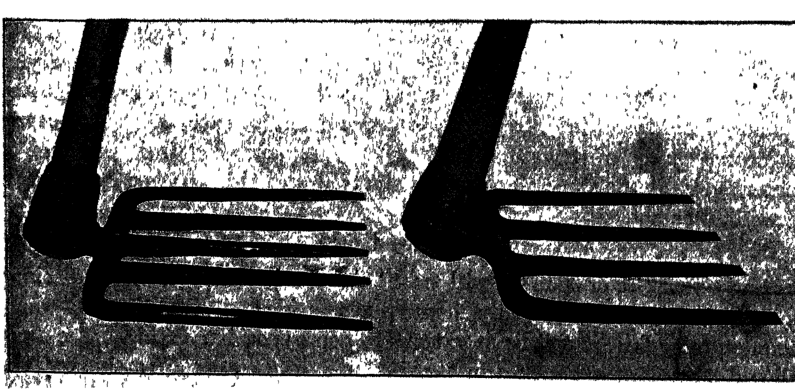
Early varieties of cherries will be fit for market this month. Packing and grading the fruit carefully should not be neglected. In districts where oranges hang late, it will be now time to commence harvesting. The fruit should be graded and packed in diagonal rows in the cases. In this way the fruit carries to the best advantage.

Fork Hoes for Orchard Work.

Reference was made in last month's Orchard Notes to a very good type of fork hoe, which is made by local blacksmiths at Castle Hill, Dural and Baulkham Hills. The pattern is in common use by citrus orchardists in the Parramatta, Galston, Kurrajong, and Gosford districts. While the price at first sight appears high (7s. 6d. for the four-pronged type, and 12s. 6d. for the five-pronged), all orchard workers who have used them find them such an improvement on the imported iron hoes that the difference is well justified. The hoes are made of the best steel and worked from the one piece, ensuring freedom from breakage, as well as ease in working. When the teeth become worn they can be sharpened by the blacksmith. The amount of ground able to be worked by a competent man with this hoe is considerably greater than with the ordinary type (some orchardists say half as much again), and their lightness and durability serve to recommend them for still more general use.



A useful form of fork hoe.



Showing "set" of handles.

Government Stud Bulls available for service at State Farms, or for lease.

Breed.	Name of Bull.	Sire.	Dam.	Stationed at—	Engaged up till
Shorthorn ...	Melba's Emblem (Vol. IV. M.S.H.B.)	Emblem of Darbalara (100 M.S.H.B.)	Melba 3rd of Darbalara (1058 M.S.H.B.)	Berry Farm ...	‖
" ...	Imperialist ... (183 M.S.H.B.)	Florio	Lady Nancy of Minembah.	Berry Farm ...	*
Jersey ...	Grenadin (imp.)	Attorney (9477)	Cyril's Carnation (imp.).	H. A. College ...	*
" ...	Trafalgar ...	Best Man ...	Rum Omelette	Cowra Farm ...	*
" ...	Kaid of Khartoum	Sir Jack ...	Egyptian Belle	Yanco Farm ...	*
" ...	Leda's Retford Pride.	Dinah's Lad ...	Leda's Angel..	Wagga Farm ...	‖
" ...	Goddington Noble XV (imp.)	Goddington Noble	La Franchise 3rd.	" ...	*
" ...	Xmas Fox (imp.)	Silver Fox ...	Malvoisie ...	H. A. College ...	‖
" ...	Janet's Queen IV Brighton of Coolangatta.	Brighton King of Coolangatta.	Janet Queen IV of Coolangatta.	" ...	*
Guernsey ...	The King's Mirror	Calm Prince ...	Vivid (imp.)...	Woodburn ...	19 Oct., '15
" ...	Godolphin Moses (imp.)	Golden Hero of the Vauxbelets (1929)	Rosetta (6509)	Wollongbar Farm	*
" ...	Hayes' Fido (imp.).	Hayes' Coronation 3rd.	Hayes' Fi-Fi 2nd.	Wollongbar ...	30 Nov., '15.
" ...	Claudius (imp.)	Golden Star II..	Claudia's Pride (imp.).	Murwillumbah ...	30 Dec., '15.
" ...	George III ...	King of the Roses	Calm 2nd ...	Wollongbar Farm	‖
" ...	The Peacemaker	Calm Prince ...	Rose Petersen	Wollongbar Farm	‖
" ...	King of the Roses	Hayes' King ...	Rosey 8th (imp.).	South Kyogle ...	30 Jan., '16.
" ...	Lauderlad ...	Laura's Boy ...	Souvenir of Wollongbar	Fairy Hill ...	— April, '16.
" ...	Belfast	King of the Roses	Flaxy 2nd ...	Tyalgum	29 Nov., '15.
" ...	Royal Preel ...	Itchen Royal ...	Hayes' Lily du Preel (imp.).	Murwillumbah ...	30 Mch., '16.
" ...	Alexander the Great.	Claudius (imp.)	Alexandrina of Richmond.	Bowraville ...	— Mch., '16.
Ayrshire ...	Wyllieland Bright Lad (imp.)	Wyllieland Gleniffer (7229)	Wyllieland Sangie	Glen Innes Farm..	*
" ...	Isabel's Majestic	Majestic of Oakbank.	Isabel of Glen-eira.	Grafton Farm ...	‖
Holstein ...	Sultan La Polka (imp. N.Z.)	King of Dominos (297 N.Z.H. & F.H.B.)	Princess La Polka (292 N.Z.H. and F.H.B.)	Berry Farm ...	*
Kerry... ...	Castle Lough Ranger (imp.)	Waterville Rover	Castle Lough Lizzie.	Bathurst Farm ...	*

*Available for service only at the Farm where stationed. † Available for lease or for service at the Farm where stationed.
‖ Available for special service where stationed upon application to the Under Secretary.

LLS FOR SALE

AT HAWKESBURY AGRICULTURAL COLLEGE.

RED POLL.—Belmont Ajax (No. $\frac{1}{32}$): born 7th January, 1912; colour, red; sire, Acton Ajax (imp.) (9,655); dam, Shamrock, by Magician (imp.) (5021) from Spinster, by Laureate (imp.) (1563) from Spot (imp.) (5136 R.P.H.B.). Price, **30 guineas.**

AT BERRY EXPERIMENT FARM.

JERSEY—Wagga Commander (319): born 10th June, 1914; colour, whole fawn; sire, Aitua's Lad; dam, Wagga Clover (781 A.J.H.B.); Aitua's Lad, by Kaid of Khartoum, from Wagga Aitua (787); Kaid of Khartoum, by Sir Jack from Egyptian Belle (382); by Tidy Punch from Egyptian Princess (imp.) (65 A.J.H.B.). Price, **12 guineas.**

SHORTHORN.—Prince Imperial: born about February, 1915; colour, dark roan; by Imperialist (183 M.S.H.B.), from Dora of Berry (1377 M.S.H.B), by Pansy King, from Dora Sangrove, by Lord Sangrove (imp.), from Lady Dora (imp.). Price, **12 guineas.**

	Milk lb.	Fat per cent.	Butter lb.
Milk yield of dam	7,868	3·7	342

HOLSTEIN.—Marshal Oyama: born 7th August, 1914; colour, black and white; sire, Field Marshal; dam, Miss Muller, by Hollander, from Margosa; by Garfield (imp.), from Maggy Obbe; by Obbe (imp.), from Margaretha (imp.). Price, **18 guineas.**

Milk yield :—	Milk lb.	Fat per cent.	Butter lb.
Miss Muller, 273 days	8,700	3·37	334·29
Margosa, 213 days...	5,946	3·07	207·18
Maggy Obbe	7,699	—	271·75
Margaretha (imp.)...	10,990	—	407

Field Artillery: born 14th August, 1914; colour, black and white; sire, Field Marshal; dam, Bercham, by Obbe II, from Lolkje Zuyder Zee; by President, from Lolkje Veeman (imp.) Field Marshal is by De Wet, from Lolkje Field; by Garfield (imp.), from Lolkje; by Joubert, from Lolkje Veeman (imp.). Price, **18 guineas.**

Milk yield :—	Milk lb.	Fat per cent.	Butter lb.
Bercham, 273 days	8,836	3·31	334
Lolkje Veeman (imp.)	11,996	—	479

AT BATHURST EXPERIMENT FARM.

KERRY—Irish Lad: born 8th December, 1914; colour, black; sire, Killarney, by Kildare II from Killiney; dam, Zena Dare, by Kildare II from Bratha Dare, by Kildare (imp.) from Bratha 4th, by Belvedere Gay Knight (imp.) from Belvedere Bratha III (imp.). Price, **7 guineas.**

Milk yields :—	Milk lb.	Fat per cent.	Butter lb.
Zena Dare (7 months yield. Still milking) ..	5,502	3·84	216·14
Killiney (273 days)	6,772	5·1	395·96
Bratha Dare (273 days)	4,577	4·4	237
Bratha 4th (13 years old)	4,784	4·7	265·1
Belvedera Bratha III (imp.)	8,310	4·51	442

BULLS FOR SALE—*continued.*

AT GRAFTON EXPERIMENT FARM.

AYRSHIRE.—No..42: born 27th March, 1914; colour, white and brown; sire, Jamie's Heir, by Jamie of Oakbank; dam, Belladonna of Russley, by Duke King of Ardgowan (imp.) from Belides; by Victor of Munnoch (imp.) from Bella (64 A.A.H.B.), by Gladstone from Beauty IV, by Cicero from Beauty III, by Nimrod from Beauty II, by Dunlop from Beauty (imp). Price, **12 guineas.**

No. 32 : born 15th December, 1913; colour, brown and white; sire, Jamie's Heir, by Jamie of Oakbank; dam, Countess of Wollongbar, by Craigielea (542 A.A.H.B.) from Countess II of Gleneira, by Lad O'Kyle (imp.) from Countess of Gleneira (938 A.A.H.B.), by Edgar (177 A.A.H.B.) from Gaiety (1006 A.A.H.B.), by Dainty Davey from Princess, by Prince from Pet, by Fred from Scottie, by Ayrshire Lad. Price, **15 guineas.**

GUERNSEY COWS FOR SALE BY AUCTION

At the LISMORE SHOW, Nov. 24, 25, and 26, 1915.

Shamrock of Illawarra (182 A.G.H.B.); born 13th February, 1908; colour, orange and white; sire, Jap 1 (1785 P.S.R.G.A.S.); dam, Shamrock of les Vesquesses VI (imp.) (6829 P.S.R.G.A.S.).
Served by Peacemaker, 12th April, 1915.

Sweetheart (188 A.G.H.B.); born 7th January, 1909; colour, lemon, fawn, and white; sire, The Admiral; dam, Souvenir of Wollongbar, by Vivid's Prince from Souvenir (imp.), by Socialist (586 E.G.H.B.) from Necklace (2526 E.G.H.B.).
Served by Peacemaker, 3rd June, 1915.

Darling of Wollongbar (38 A.G.H.B.); born 15th March, 1911; colour, dark fawn and white; sire, Royal Preel, of Wollongbar (imp.); dam, Sweetheart (188) by The Admiral, from Souvenir, of Wollongbar; by Vivid's Prince from Souvenir (imp.).
Not served yet.

Angelica of Berry (5 A.G.H.B.); born 12th January, 1912; colour, orange and white; sire, Claudius (imp.); dam, Angelica VIII (imp.) (5630 P.S.R.G.A.S), by Captain Powell (1430 P.S.R.G.A.S) from Angelica (749 P.S.R.G.A.S.).
Not served yet.

Flaxy IV (54 A.G.H.B); born 16th August, 1912; colour, lemon and white; sire, Rosehill (imp.) (2218 E.G.H.B.); dam, Flaxy III, by Lord Clatford (imp.) from Flaxy II; by Rose Prince (imp.) from Flaxy (imp.).
Not served yet.

Constance (33 A.G.H.B.); born 26th April, 1912; colour, lemon and white; sire, Hayes' Fido (imp.); dam, Faith, by Prince Souvia from Miss Clatford of Wollongbar (imp.), by Clatford Hope II (1814 E.G.H.B.) from Clatford Hopeful (imp.).
Served by George III.

Golden May of Wollongbar (74 A.G.H.B.); born 4th September, 1912; colour, orange and white; sire, Hayes' Fido (imp.); dam, Miss Golden of Wollongbar, by Golden Star II (1751 E.G.H.B.) from Bijou de la Fontaine III (imp.).

Cato of Wollongbar: born 26th December, 1912; colour, orange and white; sire, Hayes' Fido (imp.); dam, Token, by Peter (imp.) from Souvenir (imp.), by Socialist (586 E.G.H.B.) from Necklace (2526 E.G.H.B.).
Served by Peacemaker.

GEORGE VALDER,

Under Secretary and Director of Agriculture.

AGRICULTURAL SOCIETIES' SHOWS.

SECRETARIES are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 21st of the month previous to issue. Alteration of dates should be notified at once.

1915.

Society.	Secretary.	Date.
Hay P. and A. Association	G. S. Camden	Oct. 6, 7
Tweed River A. Society (Murwillumbah)	A. E. Budd	Nov. 10, 11
Mullumbimby A. Society	W. A. Davis	,, 17, 18
Lismore A. and I. Society	T. M. Hewitt	,, 24, 25, 26

1916.

Society.	Secretary.	Date.
Wollongong A., H., and I. Association	W. J. Cochrane	Jan. 14, 15
Kiama Agricultural Society	G. A. Somerville	,, 26, 27
Inverell P. and A. Association	J. McIlveen	Feb. 22, 23, 24
Newcastle A., H., and I. Association	E. J. Dann	,, 23, 24, 25, 26
Southern New England P. and A. Association (Uralla)	H. W. Vincent	,, 29, Mar. 1
Braidwood P., A., and H. Association	L. C. Chapman	Mar. 1, 2
Gunning P., A., and I. Society	J. R. Turney	,, 1, 2
Berrima District A., H., and I. Society	C. E. Wynne	,, 2, 3, 4
Tenterfield P., A., and M. Society	F. W. Hoskin	,, 7, 8, 9
Crookwell A., P., and H. Society	M. P. Levy	,, 9, 10
Nepean District A., H., and I. Society	F. J. Smith	,, 10, 11
Central New England P. & A. Association (Glen Innes)	G. A. Priest	,, 14, 15, 16
Cobargo A., P., and H. Society	T. F. Kennelly	,, 15, 16
Coramba District P., A., and H. Association	H. E. Hindmarsh	,, 15, 16
Manning River A. and H. Association	L. Plummer	,, 15, 16
Gundagai P. and A. Society	A. Elworthy	,, 15, 16
Walcha P. and A. Association	J. N. Campbell	,, 15, 16
Camden A., H., and I. Society	A. E. Baldock	,, 15, 16, 17
Macleay A., H., and I. Association (Kempsey)	E. Weeks	,, 15, 16, 17
Armidale and New England P., A., and H. Assoc'n.	A. McArthur	,, 21, 22, 23, 24
Mudgee A., P., H., and I. Association	P. J. Griffin	,, 21, 22, 23
Molong P. and A. Association	W. J. Windred	,, 22
Crookwell A., P., and H. Society	M. P. Levy	,, 23, 24
Moruya A. and P. Society	H. P. Jeffery	,, 24, 25
Warialda P. and A. Association	C. O'C. Murray	,, 28, 29, 30
Orange A. and P. Association	W. J. I. Nancarrow	April 4, 5, 6
Quirindi District P., A., and H. Association	C. G. Brandis	,, 4, 5, 6
Clarence P. and A. Society (Grafton)	G. N. Small	,, 5, 6, 7
Cooma P. and A. Association	C. J. Walmsley	,, 12, 13
Bathurst A., H., and P. Association	S. V. Turrell	,, 12, 13, 14
Upper Hunter P. and A. Association (Muswellbrook)	R. C. Sawkins	,, 12, 13, 14
Dungog A. and H. Association	C. E. Grant	May 10, 11

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Agricultural Gazette of New South Wales.

Barley: its Uses and Cultivation.

J. T. PRIDHAM, Plant Breeder.

BARLEY is a crop which is worthy of more attention on the part of farmers on account of its productiveness and general utility.

The "Official Year-book" for New South Wales gives the following figures regarding barley production as compared with that of oats and wheat:—

Value of barley crops on 31st March, 1914, £61,670; area, 20,610 acres.
Value of oat crops on 31st March, 1914, £214,130; area, 103,416 acres.
Value of wheat crops on 31st March, 1914, £5,988,200; area, 3,205,397 acres.

Average production per acre, 1914	—barley,	14·7 bushels.
" " "	—oats,	17·7 "
" " "	—wheat,	11·9 "

Turning to statistics for the United States of America, we find that their average production per acre for the years 1866 to 1905 was, for—

Barley ...	... 22·3 bushels.
Oats ...	... 21·8 "
Wheat ...	.. 12·6 "

Mr. Niel Nielsen, in his Report on Bulk Handling to the New South Wales Government in 1913, stated that "barley is the most profitable crop grown in America," the returns per acre being, for—

	£	s.	d.
Barley	3	16	0½
Buckwheat	3	3	10
Maize	3	1	6½
Rye	2	14	1
Linseed	2	13	1½
Oats	2	6	0
Wheat	2	5	6½

Classification.

The barleys in cultivation may be classified in the following way:—

Two-row barley.
- Erect-eared as Standwell.
- Drooping Ear or Chevalier as Kinver.

Six-row barley.
- Cape.
- Skinless or Naked.

The two-rowed barleys are so called because they have a row of grains on either side of the mid-rib of the ear, while what we call the six-row type has six rows of grains to the ear. These rows are not all level to the eye if an ear is broken across, as in the true six-row type, which is not commercially grown, but six-row barley is a convenient term for this group.

Skinless barley, though included, is a very distinct type; there are no beards to the ear, the grain is enveloped in thin chaff, and is easily threshed, the absence of husk giving it the appearance of wheat. In the bearded barleys the six-row type can be identified by the presence of two smaller twisted grains for each large straight one, while in the two-row type there are no twisted grains. The seed of the latter is usually fuller and more rounded with less husk than that of six-row barley.

Yield.

Mr. McKeown, manager of the Wagga Experiment Farm, says:—" During a number of years our average annual yield for the best variety of barley exceeded that of the best variety of wheat by 7 bushels to the acre." In Mr. Peacock's experience at the Bathurst Experiment Farm, too, barley on the average yields decidedly better than wheat. For a period of eight years, 1904–1911, Professor Perkins, of South Australia, obtained an average yield of 36 bushels 23 lb. from six-row barley as against 18 bushels 32 lb. from wheat for the same period. In our small experiment plots at Cowra, Wagga, and the Hawkesbury College, we have found that six-row barley has given better yields than two-row barley, but in the cooler climate of Bathurst there appears to be very little difference in productiveness between them. The former has given very good results at the Coonamble Experiment Farm on the Black Soil Plains.

Prices.

These fluctuate between 4s. and 6s. 6d. per bushel for a good sample of two-row barley, but even if the grain is only of feeding quality the usual value, as Mr. McKeown says, is 2s. 9d. to 3s. 6d. It may be said that barley at 3s. would pay the grower when wheat is 4s. per bushel, because of the increased yield obtained from barley.

Climate.

A district with a comparatively good rainfall and a cool climate is well adapted for two-row barley. The western and southern wheat districts produce good samples, as do also the northern districts, except where a good deal of summer rainfall is registered. In the warmer districts, where the grain ripens quickly, it is not possible to grow a good sample of this class of barley, and the six-row varieties will be found more profitable. Of course, the latter will not command quite such a high price as two-row barley, but the increased yield more than compensates for a lower price per bushel. Skinless barleys are drought-resistant and well adapted for grain production in dry districts. They are also much used for green fodder on the coast, where there is a good demand for the seed. In districts of good rainfall this barley grows weak straw that lodges badly if the crop is left to ripen grain.

Soil.

For barley the soil should be only moderately rich; the best grain is obtained after a crop of wheat or oats, given a sufficient period of fallow between. The most important consideration is the condition of the soil;

although any wheat soil will grow good barley, it should be so worked that it is in a mellow and a friable condition when the crop is sown. The firm seed-bed required for wheat is not at all essential for barley. It is an early ripening cereal, and the root growth is shorter and less abundant than that of oats and wheat, so that it is necessary to sow it on land that is in a high state of cultivation. Too rich a soil will cause the crop to lodge; while low-lying undrained land is unsuitable, as barley cannot withstand a great amount of moisture in its young stages.

Rotation.

Barley should follow a straw crop, such as wheat or oats, though on light or poor land it would be better to come after rape or a good fallow. The plan followed by Messrs. W. G. Reinhard and Co., of Wellington, who have grown barley for many years is to sow it after wheat which has been cut for hay. If the hay stubble is ploughed as soon as possible there is time for a few months fallow before sowing barley in May. Another most important consideration is that by this method there is no risk of self-sown wheat in the barley, and if a hay crop of wheat is again sown after barley, the farmer will be able to keep his land free from self-sown barley. Sheep turned on to the stubble will usually pick up any fallen grain. Millers strongly object to barley mixed with wheat, and such a sample is useless for seed; there are graders on the market, however, which will remove barley from wheat.

In many districts where wheat-growing and sheep-raising are combined, the rape crop is not a success, and barley under such circumstances will be found an excellent substitute for fodder, either alone or used as a supplement to the rape (sown as a mixture or in alternate rows). Barley stands feeding-off well, and a crop of grain can often be harvested after the sheep have twice eaten it down.

Time and Rate of Sowing.

May is the best month to sow in the warmer districts, April in the cooler parts of the State. The crop should ripen before the hot weather sets in, and if sown much earlier or later than the months indicated the grain is liable to be more or less shrivelled. Very early sowings induce heavy stooling, and the plants are unable to fill an unduly large number of heads. The quantity of seed usually drilled is about 50 lb. per acre, and 2 bushels if sown broadcast, as is general on the coast. If sown too thickly the crop is very apt to lodge, and as barley stools freely there is no advantage in heavy sowings.

Manuring.

The requirements of barley are much the same in this respect as those of wheat, a similar amount of superphosphate being used and, if necessary, a little potash fertiliser. Large applications of fertiliser are only necessary on very poor land, but it should be borne in mind that barley is a short-lived plant; its roots grow rapidly; they are ill-adapted to surmount obstacles such as are presented by a compact soil or to utilise fertilising matters which are not ready and waiting to be assimilated.

Harrowing the Growing Crop.

This is not often necessary as it is with wheat, though circumstances may arise in which rolling followed by harrowing will be beneficial, or a stroke of the harrow alone.

Feeding-off.

Where the crop is grown for seed it is not advisable to feed-off unless the winter has been mild and the growth too rank; in such a case it should be thoroughly fed down with sheep. There is no crop that responds better after being fed-off with sheep than barley; but it is not wise to put stock on to the crop if cold, frosty weather has set in.

Harvesting.

This should be done with reaper and binder, if possible, though with care a satisfactory sample can be made with the harvester. By the use of the binder the grain is mellowed and improved by lying in the stooks; and the risk of loss from winds by harvesting when the grain is dead ripe, as is necessary with the harvester, is avoided. The best time to cut is when the grain is in the dough stage, and, when threshing, the machine must be set so that the grain is not clipped and closely dressed—a little "tail" or beard left on the seed is not objected to. If the harvester is used the combs should be more open than is necessary with wheat, and it is an advantage to remove the concaves. All machinery agents will supply full information in regard to harvesting, as they recognise that their machines require a little adjustment before going from wheat into barley.

Stooking and Stacking.

Barley should be stooked the same day as it is cut to prevent discoloration of the grain, and it must be dry before stacking. This is more important than in the case of oats and even wheat; if barley becomes heated in the stack the colour and vitality of the grain will be affected.

Thatching.

On account of the soft absorbent nature of its straw, a barley stack requires to be well protected.

Varieties.

Those recommended by the Department are:—

Two-row barleys (commonly called Malting barleys), Standwell and Maltster, at the Bathurst, and Kinver, Golden Grain, and Goldthorpe at the Wagga Experiment Farms, in the order named. Gisborne or Duckbill has been suggested for further trial at the latter farm.

Six-row (commonly called "feed barleys"), Skinless for green fodder for winter and grain for stock in districts with mild winters. Cape for green fodder and grain for stock in the cooler districts.

We have a few general purpose varieties of the Cape type, but of better quality, which were received some years ago from Algeria. They have done well at the Cowra and Coonamble Farms, but are not yet available for distribution.

Uses of Barley.

Although most of the grain produced is utilised for malting purposes, the object of this paper has been to draw attention to the feeding value of the crop. If a sample is not good enough for the brewery, it may be used for feeding to stock. As a grain food barley is coming more into favour in Victoria, mainly in the western districts and in the north east. Professor Henry, of America, says that "barley lies between oats and maize in protein and carbohydrates, and has less oil than either. On the Pacific Coast of the United States of America it is much used for horse feed, because maize and oats do not grow so well there. . . . If ground it forms a pasty mass in the mouth; it is better to crush the grain between iron rollers." Mr. McKeown gives his working horses either wheat or barley at the rate of 4 lb. per day with good results. The grain is scalded or boiled, and for horses not at work barley straw is preferred to wheaten. Professor Perkins, of South Australia, says that "taking yield into consideration, barley is one of the cheapest concentrated foodstuffs that we can grow, and if not satisfied with local prices it can always be converted into pork or mutton at a profit, or fed to horses instead of oats." In Asia, North Africa, and Southern Europe horses are fed on barley grain and straw; the climate is too warm for oats.

Its use as green fodder has already been mentioned, both on wheat and sheep farms, and also in the coastal districts for dairy stock. Barley is the earliest straw crop for green feed the farmer can grow; Skinless barley is ready first, followed by the six-row or Cape type, and the latest to mature is two-row or malting barley, so that a succession of feed can be maintained. Barley as human food is limited to a preparation known as pearl barley. As poultry food it is valuable, and all pig-raisers attest to its high qualities as a producer of pork and bacon of the best grade.

Improvement of the Crop.

A prime sample of barley is high in starch and low in nitrogen, so that it is not a difficult matter to increase the yield of this crop since proteids, which are expensive to produce, do not enter largely into its composition. A start should be made just before harvesting the crop in selecting a number of vigorous, healthy plants The seed of these should be bagged, and sown again next season in a small plot, as described in methods of wheat improvement. This plan will result in increased yields, as well as smut-free crops; a stock of high-class seed can soon be raised in this way, and the grower will be well repaid for his trouble. In Wisconsin the average yield of pedigree barley for six years, as produced by the members of the Wisconsin Experiment Association, is given as 34 bushels per acre, as against 29·3 bushels with other varieties. Pedigree barley at the Experiment Station yielded an average of 44·8 bushels per acre for the five years 1908–12, while common barley grown by Wisconsin farmers averaged, for the same period, 27·7 bushels. Mr. Beaven, in his barley experiments at Warminster, England, when testing a variety of barley, grows it in alternate short rows with a standard sort, twelve seeds to each row, and the total number of rows would be about 100. Each pair

of rows is considered as a separate experiment, so that the average of a large number of results is taken, affording a reliable conclusion as to the relative value of the two varieties. When harvesting, the eight central plants of each row are weighed.

Mr. Peacock, of the Bathurst Experiment Farm, has grown a number of very distinct types, originating from a natural cross-bred which appeared on this farm. They each breed true, but have not been found sufficiently productive to be propagated.

We have done a little artificial crossing with barleys, but nothing of any particular value has been secured as yet. A beardless barley with fairly strong straw would be valuable for fodder.

Smut.

In common with wheat there is both "ball" or "covered" smut, and "loose" or "flying" smut to be reckoned with. The former is the more common kind, however, and the bluestone and lime-water treatment as for wheat will be found effective. For the latter the bluestone pickle is not satisfactory, as infection with the disease occurs at flowering time, and soaking in hot water is the treatment. This demands considerable care and the use of a thermometer, and it is better to raise clean seed by selection rather than go to the trouble of pickling each season. The Departmental barleys are descended from healthy plants, and we never find smut in our bulks of home-grown seed. If smutty seed must be sown the smut balls should be floated off before putting in bluestone pickle; if this is carefully done the crop will be comparatively free from smut.

Disadvantages.

There are certain drawbacks to barley-growing, the chief of which is the fluctuation in price. When there is a good season and a full supply, the merchants cut down the price which is not regulated as in the case of wheat by the world's market, but has a purely local value. An export trade would relieve such a state of affairs, also the more extended use of barley as a food for farm animals—it is becoming more popular in America for this purpose. Damage by unfavourable weather occurs in some seasons, causing a big drop in prices; rain at harvest time discolours the seed, and is more apt to cause lodging of the crop than in the case of wheat. The harvesting of barley demands more care and attention than need be given to wheat, cracked or chipped grains are very objectionable. Although, as Professor Perkins says, the farmer who grows barley is not compelled to advertise the fact in his wheat fields, the mixing of wheat with barley grain is found a source of trouble on some farms. This can be overcome by proper management, as stated under the heading "Rotation."

AUTHORITIES QUOTED.—Prof. A. J. Perkins, "The advantages of associating Wheat with Six-row Barley on some of our Lower North Farms." Mr. G. M. McKeown, of the Wagga Experiment Farm. L. H. Bailey, "Cyclopædia of American Agriculture." H. B. Derr, "Bulletin 443," U. S. America, Dept. Agric., 1911. Henry, "Feeds and Feeding." R. A. Moore and A. L. Stone, "Experiment Station Record," Aug., 1914, p. 134. Storer, "Agriculture in some of its relations with Chemistry." Barley breeding, "The World's Work" magazine, March, 1915. Prof. A. J Perkins, "Journal of Agriculture," South Australia, Oct. 1914. Percival, "Agricultural Botany."

The Production of Malting Barley.

J. R. DAVIDSON.

So long as ales and beers are brewed, one of their essential constituents will be barley. The cereal is of almost world-wide production, and its importance as a grain crop will be the better appreciated by a comparison with the production of wheat in three of the leading grain producing countries for the year 1912, the latest figures obtainable:—

	Barley.	Wheat.
Russia in Europe ...	436,352,472 bushels.	621,813,850 bushels.
United States ...	217,016,000 „	708,064,000 „
Germany	153,485,416 „	160,180,258 „

In the United Kingdom the barley crop exceeded wheat by 804,896 bushels.

During the same year the figures for Australia show 3,859,116 bushels of barley, as compared with 91,981,070 bushels of wheat, whilst (significant fact) 546,177 bushels, valued at £109,466, were imported into the Commonwealth during that period.

Apart from the use of barley for brewing purposes, the feed value of the grain for various stock is not here properly recognised, though it is popular, and justly so, as a green fodder crop.

Before it can be utilised by the brewers, barley requires to be converted into malt, and the most profitable outlet for the farmer growing the crop is per medium of the maltster. The requirements of the maltster call for grain of good quality, with certain necessary characteristics. Many districts in New South Wales are well adapted for producing such barley, and it has long been a matter for surprise that in these areas the crop has not been more generally grown.

In the New South Wales Official Year Book for 1914 the Government Statistician says:—"Barley is an important crop, but at present is produced only on a moderate scale although there are several districts where the necessary conditions as to soil and drainage present inducements for cultivation, and particularly with regard to the malting varieties."

It requires no special cultivation which is not desirable with other cereals, but care is necessary in the harvesting, and the element of risk through damage by adverse weather conditions at harvest time is greater than with wheat. Still, as compared with wheat, the yield is normally much higher and the market value almost invariably well above. A comparison on these two points will prove of interest.

According to the Commonwealth Statistician the export values per bushel of Australian wheat from 1904 to 1913 were as follow:—

	s.	d.		s.	d.
1904	3	2	1909	4	2
1905	3	5	1910	4	2
1906	3	3	1911	3	6
1907	3	4	1912	3	11
1908	4	1	1913	3	9

Over the same period, for the average price of malting barley in the Melbourne market, which governs the markets for this grain in other States, the authority mentioned gives the following prices per bushel:—

	s.	d.		s.	d.
1904	3	6	1909	3	10
1905	4	0	1910	4	1
1906	4	5	1911	4	10¼
1907	4	8	1912	5	11½
1908	4	10	1913	3	11½

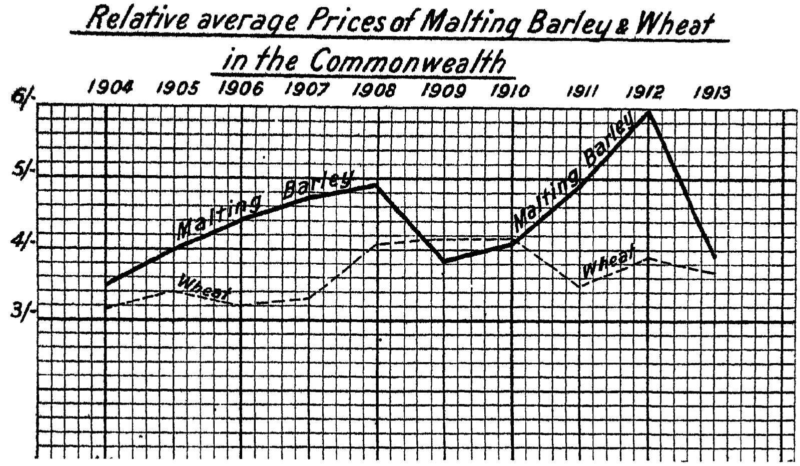
In the matter of average yield per acre in New South Wales over the same seasons, the State Government Statistician shows the following:—

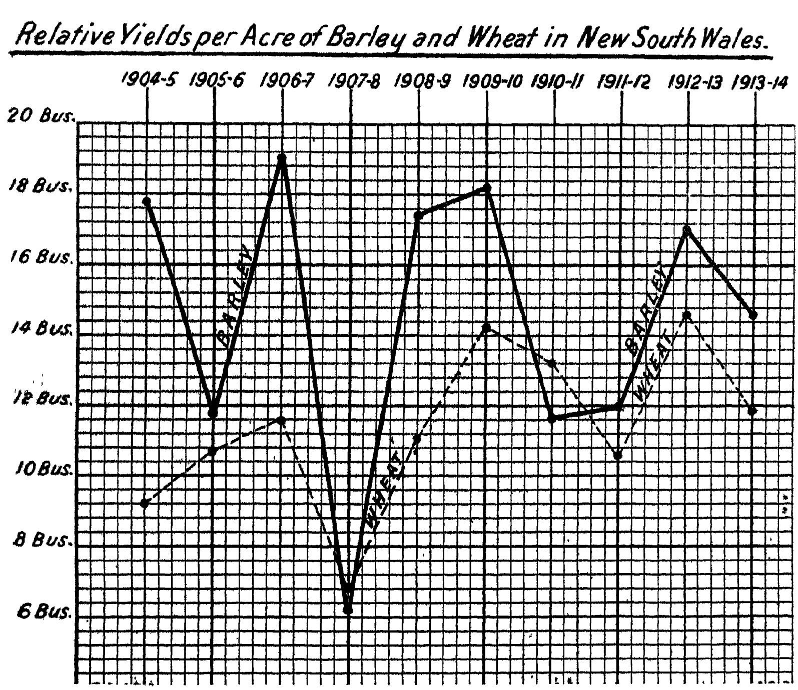
	Wheat. bushels.	Barley. bushels.
1904–5	9·27	17·9
1905–6	10·69	11·7
1906–7	11·69	19·1
1907–8	6·59	6·3
1908–9	11·11	17·5
1909–10	14·34	18·1
1910–11	13·11	11·6
1911–12	10·54	11·9
1912–13	14·56	17·1
1913–14	11·86	14·7

The same authority, speaking of barley, says:—"The average crop during the last ten years has been 15 bushels per acre, but this rate should not be regarded as characteristic, as the returns for many seasons indicate that an average crop of 18 bushels per acre may be expected under normal conditions."

Shown in graph form, on the following page, the advantages to the grower of barley over wheat, in both the above respects, are very apparent.

The aggregate barley crop in New South Wales for the season 1913–14, the largest on record, was 303,447 bushels. Distinction is not made between that utilised for malting and for feed purposes, but a reasonable estimate for the former in the season mentioned would probably be two-thirds of the total, namely, 200,000 bushels. During 1913 the antity of malt used in New





THE PRODUCTION OF MALTING BARLEY.

South Wales breweries was 809,171 bushels. This shows a deficiency in the year in question of upwards of 600,000 bushels in the local supplies of malting barley required by our maltsters and brewers. The latter imported by far the greater proportion of this in the form of malt from other States of the Commonwealth and from overseas, thus not only finding employment for a large number of hands in malt houses outside of this State, but providing a considerable market which could be availed of by our farmers. Certainly there are not at present malt-houses in New South Wales to cope with the whole requirements of our breweries, but the fact that new maltings have been erected during the past year or two indicates clearly that capital will be readily forthcoming for expansion in this respect when our farmers produce barley in sufficient quantities to keep other new maltings employed, without the importation of barley being necessary.

The possibility of local over-production, in view of the very considerable shortage which exists in local supplies, is therefore remote, and need not occasion concern to intending growers of this crop for years to come. For technical reasons connected with the conversion of barley into malt, as well as the avoidance of risks attendant on the importation of grain, maltsters prefer locally grown produce, provided the quality, which is the supreme consideration, is satisfactory. One company has for years past offered and given farmers an undertaking to purchase their crops, assuring a satisfactory minimum price, on the one condition as to quality.

Departmental Experience with Barley.

Some instructive comparisons may be made from reports of the managers of the Experiment Farms, as recorded in the *Agricultural Gazette*. In June, 1911, Mr. G. M. McKeown, under the heading "Crops at Wagga Experiment Farm, 1910," says :—"The highest yield of Federation in the experiment plots was 34 bushels. The rest of the paddock was occupied by Firbank wheat, which returned 19 bushels 25 lb. per acre, and Kinver malting barley 37 bushels 6 lb. per acre." Also, in the same article :—"Barley returned the following yields per acre :—

Skinless	22 bushels	42 lb.
Kinver	37 ,,	6 ,,
Goldthorpe	32 ,,	42 ,,
Golden Grain	39 ,,	21 ,,
Gisborne	19 ,,	39 ,,
World's Champion	17 ,,	43 ,,

The two last-named are new varieties."

In "Paddock Accounts from Wagga Experiment Farm" (*Agricultural Gazette*, September, 1912) were set forth statements of account, "showing the expenditure and returns from a farmer's point of view, assuming that in each case his paddocks had received similar treatment to that carried out at the Experiment Farm." Charges for seed, manure, ploughing, harvesting,

&c., are set out against the returns for each paddock, and the balance (or profit) given. A comparison is made below of the best wheat paddock and the only malting barley paddock shown in these accounts:—

Wheat (Federation).—Paddock No. 6, area 68 acres. Crop harvested—1,637 bushels, at 3s. 8d., or 24 bushels per acre. Gross return—£300 2s. 4d., or £4 8s. 3d. per acre. Profit—£166 7s. 1d., or £2 8s. 11d. per acre.

Malting Barley.—Paddock No. 7, area 35 acres. Crop harvested—938 bushels, at 4s. 9d., or 26·8 bushels per acre. Gross return—£222 15s. 6d., or £6 7s. 3d. per acre. Profit, £165 16s. 7d., or £4 14s. 9d. per acre.

It will be noted that, although the area of the wheat paddock was practically double that sown with barley, the profit from each was about the same, making the profit from the barley per acre almost double that from the wheat.

In the *Gazette* of April, 1913, Mr. R. W. Peacock dealt with the crops grown at the Bathurst Experiment Farm during 1912. In this year the conditions were abnormal, a very dry autumn and a cold wet winter. Mr. Peacock said:—"The cold conditions of June, July, and August, together with the water-logging owing to excess of rain, had a very marked effect upon the various crops—the oats and barleys thriving, whereas the wheats were placed at a decided disadvantage. The oats and barley crops were very good, and equal to those grown during the best of seasons, whereas the wheats were seriously affected, &c." Again, Mr. Peacock says:—"Throughout the farm, the fact that oats and barleys withstood the conditions, when sown in a dry seed-bed, better than wheat, was apparent." The yield of the best wheat paddock (Federation) was 26 bushels 57 lb. per acre, whilst the yield of Standwell malting barley was 49 bushels 15 lb. per acre, and Cape barley 51 bushels 3 lb. per acre, so that these barleys yielded almost twice as much as the farm's best wheat in this year—threefold and fourfold as much as other wheats.

Dealing with his report for the same season of 1912, Mr. Peacock, in the *Gazette* of November, 1913, supplies particulars of the returns from each paddock. The following are his figures for the wheat (for grain) paddock above referred to, and a barley paddock, in which was sown Standwell malting, Cape, and Skinless barleys:—

Wheat.—Paddock No. 10, 10·2 acres. Gross returns (including straw)—£74 6s. 8½d., or £7 5s. 9d. per acre. Profit—£38 14s. 9d., or £3 15s. 11d. per acre.

Barley.—Paddock No. 1A, 7·19 acres. Gross returns (including straw)—£79 2s. 4d., or £11 per acre. Profit—£45 1s. 7d., or £6 5s. 4d. per acre.

If the wheat had been sold at milling rates (3s. 3d. per bushel) and the barley even at feed rates (3s. per bushel), the returns for these paddocks would have been more markedly in favour of barley, viz.:—

Wheat—Profit, £12 6s. 6½d., or £1 4s. 2d. per acre.
Barley—Profit, £22 18s. 8d., or £3 3s. 9d. „

With respect to crops at the Cowra Experiment Farm, a return is published in the *Gazette* of April, 1914, by Mr. M. H. Reynolds, the Manager, showing the following comparative figures:—

Wheat (for grain).—62 acres. Yield—1,165 bushels, at 3s. 6d. per bushel, or 18·79 bushels per acre. Gross returns—£203 17s. 6d., or £3 5s. 9d. per acre.

Barley.—2 acres. Yield—69 bushels, at 4s. per bushel, or 34·5 bushels per acre. Gross returns—£13 16s., or £6 18s. per acre.

For the last season (1914–15), one of disastrous drought in Victoria and South Australia, the Government Statists of these States, in their official returns of the grain production for the season, give the following remarkable figures:—

Victoria—			
Average yield of	Wheat	1·38	bushels per acre.
„	Malting barley ...	11·79	„ „
„	Other barley ...	7·43	„ „
South Australia—			
Average yield of	Wheat	1·41	„ „
„	Malting barley ...	7·63	„ „
„	Barley (all kinds)	6·75	„ „

Comment is needless as to the respective drought-resistant properties of the two crops.

Requirements for Malting Purposes.

Below a certain standard barley is useless to the maltsters, but those already established are too anxious to secure the right class of local grain to find fault without full justification. It must be borne in mind that it is part of the maltster's avocation to be a judge of the quality of barley for his purposes, and farmers must have considerable experience with the crop before becoming similarly qualified as judges.

As the process of malting is dependent upon germination, the prime and absolute necessity in barley for this purpose is vitality—that is, its germinating capacity must not be impaired through any cause. This is the fact which the grower of barley must keep most prominently in view when growing the crop for malting purposes, and the risks of damage in this direction, right up to the delivery of his grain, are the only ones the farmer really runs, apart from absolute destruction from any such causes as fire and flood.

Damage to germinating properties may be occasioned by forces quite outside the farmer's ability to avoid, such as rain on a ripe crop, but other causes may be avoided by care on his part. Carelessness in harvesting is the most general cause of damage, and too much attention cannot be paid to this operation, whether done by reaper and binder, reaper-thresher, or stripper-harvester.

The last-mentioned method of harvesting, though the least desirable, is the one most in vogue in this State, and comments which apply in this case are largely applicable to the other methods. The machines must not be driven

too fast, and the grain must not be broken or damaged by "nibbing" or skinning. Even a comparatively small percentage of damaged corns will spoil an otherwise good sample, as, in the malting process, such damaged corns will spread mould and disease amongst the sound and healthy grains, and render the malt unsatisfactory. Barley straw is very brittle, and the crop threshes much more easily than wheat, so that danger of damage is correspondingly increased unless attention and care are devoted to the harvesting operation. Before this is commenced the machines should be properly adjusted in regard to beaters, concaves, drums, screens, &c. The hands working the machines should be specially cautioned as to the results required, and the samples being obtained by each should be frequently examined.

After being bagged the grain should not be left exposed in the paddocks without covering, as rain on the bags will almost certainly damage the contents, for barley absorbs moisture much more readily than wheat. For the same reason it should always be stacked off the ground, and in course of transit, or when stacked at railway stations, should always be covered by tarpaulins.

Apart from freedom from damage, the maltster's other important requirements in barley are plumpness, mealiness, uniformity, and good colour, qualities all more or less dependent upon the soil, season, methods of cultivation, and weather at harvesting. At the same time much in regard to these rests with the judgment and attention of the farmer at the time the crop is ripening.

For instance, unless it is to be cut and stacked, it should not be harvested on the green side—it should be fully ripe, but not over-ripe. If it is not ripe, or harvested when the grain is moist from rain or heavy dews, sweating and consequent discoloration, with an impairment of its germinating properties, will almost certainly take place in the sacks. Should the crop not have ripened evenly, any sacks containing grain not fully matured mixed through that which is ripe, should, if possible, not be sewn up immediately or stacked, but the sacks should be stood on end in a dry place in such a manner as to permit of the free passage of air between them until the grain is thoroughly dry. Better still, if practicable, such grain should be spread on covered floors and turned occasionally until it is so dry that there is no danger of sweating when it is bagged. In some countries this practice is invariably followed with all the barley after being threshed.

If a crop is harvested before thoroughly ripe, the grain will be "flinty" or "ricey," and not mealy or floury in character when broken, as is required in a prime malting sample.

All possible care should be exercised to see that the grain is reasonably uniform in size and condition. If the harvesting machines used do not permit of the screening of thin or unfilled grain from the bulk, in order to obtain best prices from maltsters the harvested barley should be passed through a grader. There should be no avoidable proportion of thin grain in

a sample to be offered for malting purposes. Even barley of small size, so long as it is fairly well filled and uniform, and otherwise suitable, is preferable to a sample which contains a quantity of bold, plump grain, but on the whole is uneven.

Rather than the crop should be threshed so hard that the husk or skin is partially removed, it is better that the awns or beards should not be entirely dressed off the grain; but it must not be understood that maltsters, and much less persons buying for feed purposes, wish to have barley delivered in such a condition that a large proportion of awns remain. When harvesting or threshing is being carried out, the machines should be set so as to thresh off as much as is possible of the awns without the grain being hit too hard. Should there be included in a line of barley any undue proportion of straw, unthreshed heads, or long awns, difficulty will probably be found in disposing of it, or a risk run of rejection on delivery, as ordinary screening machines will not satisfactorily treat such grain without a heavy loss being occasioned.

If a portion of the crop is poorer than the remainder, or not so ripe, or unevenly ripe, this should be harvested separately, and not allowed to get into the same bags as the better portion, as even a small proportion of this, if mixed through good grain, may spoil the lot for the maltster.

Colour is always an important consideration, and it should be the aim of the farmer to preserve the bright natural light yellow of undamaged barley.

Weevil is a bugbear of the maltster, but it should not be necessary to caution the farmer against using old, uncleaned bags which have previously contained weevilly grain. If weevil has got into barns or stores it is not only on account of barley that the pest should be thoroughly rooted out.

Before concluding, it may be mentioned that what is usually referred to as "Malting" or "English" barleys are those of the two-row (or Chevalier type) varieties. But six-row (or Cape type) barleys are very largely used for brewing purposes, and are therefore malted. Hitherto, so-called "Cape" barley has been little, if at all, bought by maltsters in New South Wales, mainly due to lack of facilities. With, however, the extension of existing malt-houses will come a demand for "Cape" barleys, and, although this class of grain does not realise as high a price as two-row barley, it is usually a heavier cropper, and not so liable to damage through careless harvesting. Six-row barley must, for malting purposes, be of good quality, well filled, and of bright colour. It is very necessary to have good seed, and trials are being made with promising varieties.

The writer has in this article endeavoured to show the scope for increasing the production of barley for grain in New South Wales, and at the same time the requirements of the buyers who will pay the best price, viz., the maltsters. These may appear somewhat exacting, but the difficulty of meeting the same is more apparent than real, if reasonable attention to harvesting is given by the farmer, and the main results desired are borne in mind. Success with the crop means a very fine reward for trouble taken, as the

experience of many careful farmers, and the figures given early in this article, attest. The results over a number of years will prove that the failure to produce grain sufficiently good for malting purposes in an occasional season still leaves a credit balance in favour of malting barley as compared with wheat.

A Grower's Advice.

In the course of an interesting letter, describing the advantages and disadvantages of growing malting barley, Mr. C. Jeffries Britten, of Tamworth, makes this valuable suggestion:—

"I recommend farmers to sow one quarter to one-fifth of their cultivation area with barley; that means that they will have sufficient harvesting machinery to get the crop off in less than a week, and that is important, for the grain must be dead ripe before they start, and after it has been ripe for more than a week the heads fall off the stalks very easily. I have seen many instances of farmers getting a gross return of £7 or £8 per acre off their small area of barley, as against £5 or £6 per acre off their larger area of wheat: next year they think it is a wise thing to sow all with barley, and, not having sufficient machinery to harvest the crop in a week or ten days, they are disappointed with the result, and give up barley-growing in disgust."

The Growing of Barley in California.

One of the most startling features in connection with the agricultural production of the State of California has been the way in which barley has forged ahead until it equals in acreage and exceeds in yield and value all other grain crops combined. Whereas barley had in 1914 no fewer than 1,941,506 acres sown, wheat followed a long way after with 725,214 acres, while oats came third with 315,975 acres.

The remarkable change in the positions of the cereals may be indicated in the following summary:—

	1862.	1910.	1914.
	Acres.	Acres.	Acres.
Maize	17,339	51,935	89,144
Wheat	361,351	478,637	725,214
Rye	1,415	7,027	24,320
Oats	36,607	192,158	315,975
Barley	223,217	1,195,158	1,941,566
Potatoes	3,624	72,799	66,470
Hay and Forage (including lucerne)	250,464	2,049,213	2,533,347
Total	894,017	4,046,927	5,696,036

In 1914 the yields of the three main cereals crops were:—Barley 42,060,000 bushels (of 48 lb.), oats 7,700,000 bushels (of 32 lb.), and wheat 6,800,000 bushels (of 60 lb.).

In view of the similarity between the climatic conditions of California and New South Wales, there should be no doubt about this State being able to raise at least sufficient barley for its own requirements.

Practical Irrigation-farming in Australia.

WITH SPECIAL REFERENCE TO FRUIT AND FODDER CROPS.

[Continued from page 804.]

A. M. MAKINSON, B.A., Organising Inspector, Agricultural Bureau.

PART IV.

Grading and Channel Making—The Use and Misuse of Irrigation-water.

WHEN a farm has been properly laid out, divided into blocks, and the position of channels and ditches, methods of irrigation, and length and direction of water-furrows have been determined, the land should be ploughed and graded, and the routes of channels and ditches raised, if necessary, before the latter are constructed.

A preliminary Ploughing.

On many soils a deep subsoil ploughing before planting is of great and lasting advantage, particularly in heavier classes of land, where there is a crust not far from the surface, or in land about to be planted with vines on resistant stocks; the loosening up of the subsoil enables the roots of trees and vines to extend freely and take full advantage of the available moisture and plant-food. In the early days of Mildura traction engines were used for this work, and were found very effective. Growers say that fruit-blocks in Mildura still show the benefit of the deep rooting up they got some twenty years ago. Where horses are used to draw a subsoil plough, from eight to twelve good draughts are necessary to do effective work (at a depth of 20 inches), according to the class of soil and the type of plough used.

It is not always so necessary to subsoil light sandy country for fruit-trees as it is for resistant vines, but in any case the land should be turned over by an ordinary mould-board plough to a depth of from 8 to 10 inches before planting, so that the fertile soil on the surface may be buried deeply enough to be maintained in a constant state of moisture where the roots can always feed upon it.

Grading.

Grading is a process that should be resorted to sparingly, and, as has been pointed out in a preceding article, land which requires a great deal of grading should not be selected for an irrigation farm. Heavy grading entails the removal of much surface soil, which is richest in plant food, from the higher parts of the land. The higher parts are thus left impoverished, and although

the hollows may be enriched, a block of land which has been heavily graded will always present a piebald appearance, producing poor crops where the surface-soil has been removed, and perhaps over-luxuriant foliage where it has been deposited. Where much grading is unavoidable, this result may in some instances be obviated by disturbing the surface-soil as little as possible on the high parts and filling in the hollows with surface-soil taken from somewhere outside the area to be planted, or by temporarily removing the surface-soil from the higher parts into heaps, and replacing it when the hollows have been filled in with soil taken from underneath; either process is, however, likely to be somewhat expensive.

While grading is in progress levels should frequently be taken over the ground; if this is done it will be easy to judge the effectiveness of the work, and over-grading and unnecessary work will be avoided. It sometimes happens that it is necessary to devote a good deal of time to shifting earth from one particular spot and dumping it in another, and in such a case the scraper will of course travel by the shortest distance between the two places; but in doing ordinary work it will be found an advantage to travel the scraper backwards and forwards approximately in the direction that is to be taken by the water-furrows, picking up earth and spreading it as may be required. Where a hollow is to be filled in, it must be remembered that the loose soil will settle when it gets the water, and allowance must be made for this. The cost of grading may be anything up to £2 an acre, but should not exceed that figure.

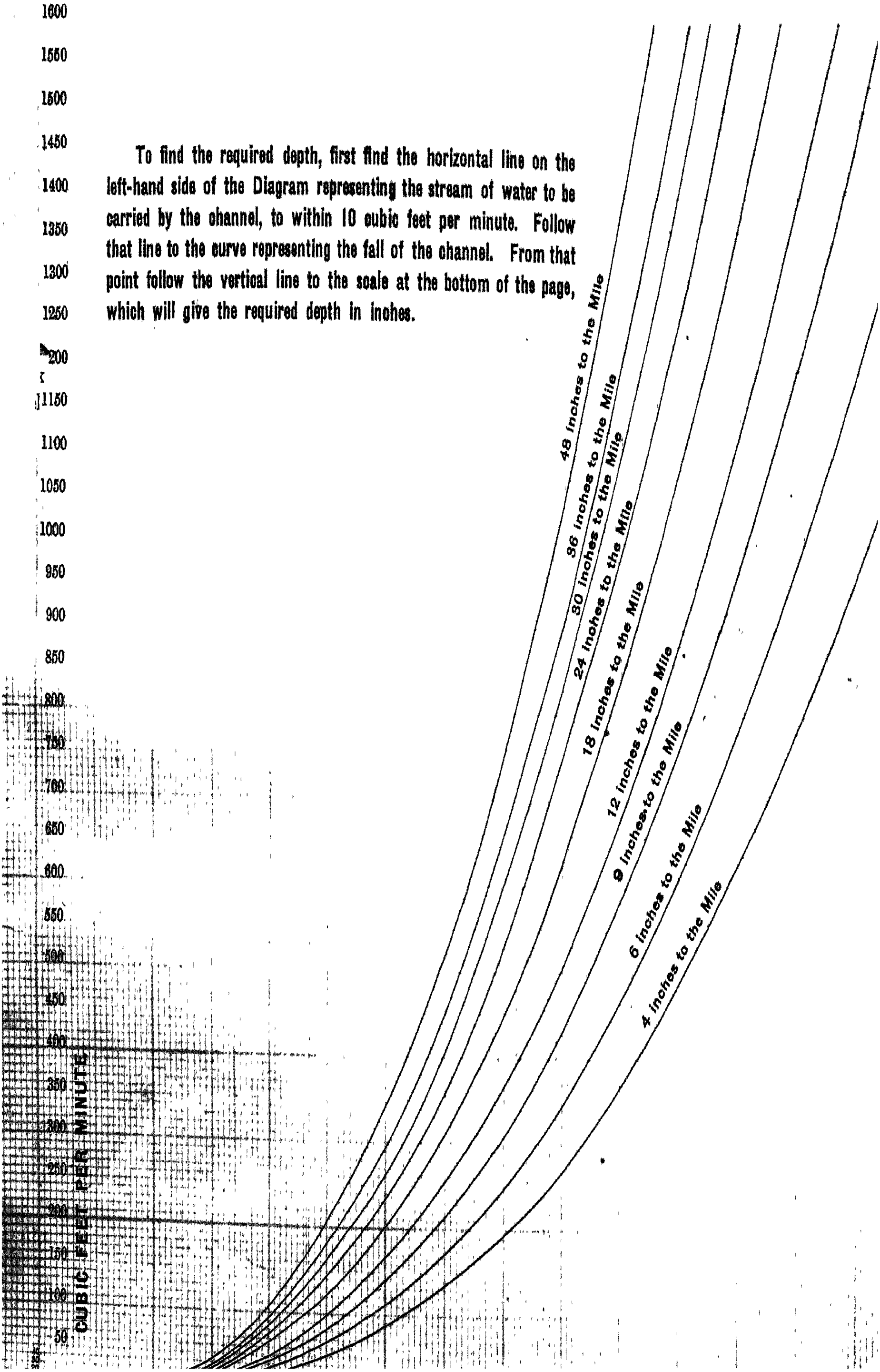
Grading should be done early in the autumn, and the land pegged out for planting as soon as it is finished. Where the soil is loose and liable to drift, a crop of some sort, barley for preference, should be drilled in beside the channel routes and between the rows of pegs, leaving a strip bare along each row where the trees or vines are to be planted. This will prevent the soil from drifting, and may be cut for hay in the spring.

The Buck-scraper.

Few men become proficient in the use of a four-horse buck-scraper without a good deal of practice, and it will not generally pay the new-chum irrigation farmer to attempt this work himself, if he can get an experienced hand to do it for him. The amateur will do unnecessary work as a rule, and so waste a good deal of time and horse feed.

It is most important that the two chains that connect the scraper with the swingle-bars should have exactly the right draught, so that the scraper will balance properly. If these chains are adjusted too far back, it will take the strength of a strong man at the handle to prevent the scraper from burying itself, and if too far forward it may take two men to tip the load. When they are properly adjusted, the man at the handle should be able to regulate the depth of cut to an eighth of an inch, and spread the load with the same nicety, and without great effort. A steady, even team is very necessary for buck-scraping—steady horses will help a man with his work, and he will

To find the required depth, first find the horizontal line on the left-hand side of the Diagram representing the stream of water to be carried by the channel, to within 10 cubic feet per minute. Follow that line to the curve representing the fall of the channel. From that point follow the vertical line to the scale at the bottom of the page, which will give the required depth in inches.



Skinless barley, though included, is a very distinct type: there are no beards to the ear, the grain is enveloped in thin chaff, and is easily threshed, the absence of husk giving it the appearance of wheat. In the bearded barleys the six-row type can be identified by the presence of two smaller twisted grains for each large straight one, while in the two-row type there are no twisted grains. The seed of the latter is usually fuller and more rounded with less husk than that of six-row barley.

Yield.

Mr. McKeown, manager of the Wagga Experiment Farm, says:—"During a number of years our average annual yield for the best variety of barley exceeded that of the best variety of wheat by 7 bushels to the acre." In Mr. Peacock's experience at the Bathurst Experiment Farm, too, barley on the average yields decidedly better than wheat. For a period of eight years, 1904–1911, Professor Perkins, of South Australia, obtained an average yield of 36 bushels 23 lb. from six-row barley as against 18 bushels 32 lb. from wheat for the same period. In our small experiment plots at Cowra, Wagga, and the Hawkesbury College, we have found that six-row barley has given better yields than two-row barley, but in the cooler climate of Bathurst there appears to be very little difference in productiveness between them. The former has given very good results at the Coonamble Experiment Farm on the Black Soil Plains.

Prices.

These fluctuate between 4s. and 6s. 6d. per bushel for a good sample of two-row barley, but even if the grain is only of feeding quality the usual value, as Mr. McKeown says, is 2s. 9d. to 3s. 6d. It may be said that barley at 3s. would pay the grower when wheat is 4s. per bushel, because of the increased yield obtained from barley.

Climate.

A district with a comparatively good rainfall and a cool climate is well adapted for two-row barley. The western and southern wheat districts produce good samples, as do also the northern districts, except where a good deal of summer rainfall is registered. In the warmer districts, where the grain ripens quickly, it is not possible to grow a good sample of this class of barley, and the six-row varieties will be found more profitable. Of course, the latter will not command quite such a high price as two-row barley, but the increased yield more than compensates for a lower price per bushel. Skinless barleys are drought-resistant and well adapted for grain production in dry districts. They are also much used for green fodder on the coast, where there is a good demand for the seed. In districts of good rainfall this barley grows weak straw that lodges badly if the crop is left to ripen grain.

Soil.

For barley the soil should be only moderately rich; the best grain is obtained after a crop of wheat or oats, given a sufficient period of fallow between. The most important consideration is the condition of the soil;

although any wheat soil will grow good barley, it should be so worked that it is in a mellow and a friable condition when the crop is sown. The firm seed-bed required for wheat is not at all essential for barley. It is an early ripening cereal, and the root growth is shorter and less abundant than that of oats and wheat, so that it is necessary to sow it on land that is in a high state of cultivation. Too rich a soil will cause the crop to lodge; while low-lying undrained land is unsuitable, as barley cannot withstand a great amount of moisture in its young stages.

Rotation.

Barley should follow a straw crop, such as wheat or oats, though on light or poor land it would be better to come after rape or a good fallow. The plan followed by Messrs. W. G. Reinhard and Co., of Wellington, who have grown barley for many years is to sow it after wheat which has been cut for hay. If the hay stubble is ploughed as soon as possible there is time for a few months fallow before sowing barley in May. Another most important consideration is that by this method there is no risk of self-sown wheat in the barley, and if a hay crop of wheat is again sown after barley, the farmer will be able to keep his land free from self-sown barley. Sheep turned on to the stubble will usually pick up any fallen grain. Millers strongly object to barley mixed with wheat, and such a sample is useless for seed; there are graders on the market, however, which will remove barley from wheat.

In many districts where wheat-growing and sheep-raising are combined, the rape crop is not a success, and barley under such circumstances will be found an excellent substitute for fodder, either alone or used as a supplement to the rape (sown as a mixture or in alternate rows). Barley stands feeding-off well, and a crop of grain can often be harvested after the sheep have twice eaten it down.

Time and Rate of Sowing.

May is the best month to sow in the warmer districts, April in the cooler parts of the State. The crop should ripen before the hot weather sets in, and if sown much earlier or later than the months indicated the grain is liable to be more or less shrivelled. Very early sowings induce heavy stooling, and the plants are unable to fill an unduly large number of heads. The quantity of seed usually drilled is about 50 lb. per acre, and 2 bushels if sown broadcast, as is general on the coast. If sown too thickly the crop is very apt to lodge, and as barley stools freely there is no advantage in heavy sowings.

Manuring.

The requirements of barley are much the same in this respect as those of wheat, a similar amount of superphosphate being used and, if necessary, a little potash fertiliser. Large applications of fertiliser are only necessary on very poor land, but it should be borne in mind that barley is a short-lived plant; its roots grow rapidly; they are ill-adapted to surmount obstacles such as are presented by a compact soil or to utilise fertilising matters which are not ready and waiting to be assimilated.

Harrowing the Growing Crop.

This is not often necessary as it is with wheat, though circumstances may arise in which rolling followed by harrowing will be beneficial, or a stroke of the harrow alone.

Feeding-off.

Where the crop is grown for seed it is not advisable to feed-off unless the winter has been mild and the growth too rank; in such a case it should be thoroughly fed down with sheep. There is no crop that responds better after being fed-off with sheep than barley; but it is not wise to put stock on to the crop if cold, frosty weather has set in.

Harvesting.

This should be done with reaper and binder, if possible, though with care a satisfactory sample can be made with the harvester. By the use of the binder the grain is mellowed and improved by lying in the stooks; and the risk of loss from winds by harvesting when the grain is dead ripe, as is necessary with the harvester, is avoided. The best time to cut is when the grain is in the dough stage, and, when threshing, the machine must be set so that the grain is not clipped and closely dressed—a little "tail" or beard left on the seed is not objected to. If the harvester is used the combs should be more open than is necessary with wheat, and it is an advantage to remove the concaves. All machinery agents will supply full information in regard to harvesting, as they recognise that their machines require a little adjustment before going from wheat into barley.

Stooking and Stacking.

Barley should be stooked the same day as it is cut to prevent discoloration of the grain, and it must be dry before stacking. This is more important than in the case of oats and even wheat; if barley becomes heated in the stack the colour and vitality of the grain will be affected.

Thatching.

On account of the soft absorbent nature of its straw, a barley stack requires to be well protected.

Varieties.

Those recommended by the Department are:—

Two-row barleys (commonly called Malting barleys), Standwell and Maltster, at the Bathurst, and Kinver, Golden Grain, and Goldthorpe at the Wagga Experiment Farms, in the order named. Gisborne or Duckbill has been suggested for further trial at the latter farm.

Six-row (commonly called "feed barleys"), Skinless for green fodder for winter and grain for stock in districts with mild winters. Cape for green fodder and grain for stock in the cooler districts.

We have a few general purpose varieties of the Cape type, but of better quality, which were received some years ago from Algeria. They have done well at the Cowra and Coonamble Farms, but are not yet available for distribution.

Uses of Barley.

Although most of the grain produced is utilised for malting purposes, the object of this paper has been to draw attention to the feeding value of the crop. If a sample is not good enough for the brewery, it may be used for feeding to stock. As a grain food barley is coming more into favour in Victoria, mainly in the western districts and in the north east. Professor Henry, of America, says that "barley lies between oats and maize in protein and carbohydrates, and has less oil than either. On the Pacific Coast of the United States of America it is much used for horse feed, because maize and oats do not grow so well there. . . . If ground it forms a pasty mass in the mouth; it is better to crush the grain between iron rollers." Mr. McKeown gives his working horses either wheat or barley at the rate of 4 lb. per day with good results. The grain is scalded or boiled, and for horses not at work barley straw is preferred to wheaten. Professor Perkins, of South Australia, says that "taking yield into consideration, barley is one of the cheapest concentrated foodstuffs that we can grow, and if not satisfied with local prices it can always be converted into pork or mutton at a profit, or fed to horses instead of oats." In Asia, North Africa, and Southern Europe horses are fed on barley grain and straw; the climate is too warm for oats.

Its use as green fodder has already been mentioned, both on wheat and sheep farms, and also in the coastal districts for dairy stock. Barley is the earliest straw crop for green feed the farmer can grow; Skinless barley is ready first, followed by the six-row or Cape type, and the latest to mature is two-row or malting barley, so that a succession of feed can be maintained. Barley as human food is limited to a preparation known as pearl barley. As poultry food it is valuable, and all pig-raisers attest to its high qualities as a producer of pork and bacon of the best grade.

Improvement of the Crop.

A prime sample of barley is high in starch and low in nitrogen, so that it is not a difficult matter to increase the yield of this crop since proteids, which are expensive to produce, do not enter largely into its composition. A start should be made just before harvesting the crop in selecting a number of vigorous, healthy plants The seed of these should be bagged, and sown again next season in a small plot, as described in methods of wheat improvement. This plan will result in increased yields, as well as smut-free crops; a stock of high-class seed can soon be raised in this way, and the grower will be well repaid for his trouble. In Wisconsin the average yield of pedigree barley for six years, as produced by the members of the Wisconsin Experiment Association, is given as 34 bushels per acre, as against 29·3 bushels with other varieties. Pedigree barley at the Experiment Station yielded an average of 44·8 bushels per acre for the five years 1908–12, while common barley grown by Wisconsin farmers averaged, for the same period, 27·7 bushels. Mr. Beaven, in his barley experiments at Warminster, England, when testing a variety of barley, grows it in alternate short rows with a standard sort, twelve seeds to each row, and the total number of rows would be about 100. Each pair

of rows is considered as a separate experiment, so that the average of a large number of results is taken, affording a reliable conclusion as to the relative value of the two varieties. When harvesting, the eight central plants of each row are weighed.

Mr. Peacock, of the Bathurst Experiment Farm, has grown a number of very distinct types, originating from a natural cross-bred which appeared on this farm. They each breed true, but have not been found sufficiently productive to be propagated.

We have done a little artificial crossing with barleys, but nothing of any particular value has been secured as yet. A beardless barley with fairly strong straw would be valuable for fodder.

Smut.

In common with wheat there is both "ball" or "covered" smut, and "loose" or "flying" smut to be reckoned with. The former is the more common kind, however, and the bluestone and lime-water treatment as for wheat will be found effective. For the latter the bluestone pickle is not satisfactory, as infection with the disease occurs at flowering time, and soaking in hot water is the treatment. This demands considerable care and the use of a thermometer, and it is better to raise clean seed by selection rather than go to the trouble of pickling each season. The Departmental barleys are descended from healthy plants, and we never find smut in our bulks of home-grown seed. If smutty seed must be sown the smut balls should be floated off before putting in bluestone pickle; if this is carefully done the crop will be comparatively free from smut.

Disadvantages.

There are certain drawbacks to barley-growing, the chief of which is the fluctuation in price. When there is a good season and a full supply, the merchants cut down the price which is not regulated as in the case of wheat by the world's market, but has a purely local value. An export trade would relieve such a state of affairs, also the more extended use of barley as a food for farm animals—it is becoming more popular in America for this purpose. Damage by unfavourable weather occurs in some seasons, causing a big drop in prices; rain at harvest time discolours the seed, and is more apt to cause lodging of the crop than in the case of wheat. The harvesting of barley demands more care and attention than need be given to wheat, cracked or chipped grains are very objectionable. Although, as Professor Perkins says, the farmer who grows barley is not compelled to advertise the fact in his wheat fields, the mixing of wheat with barley grain is found a source of trouble on some farms. This can be overcome by proper management, as stated under the heading "Rotation."

AUTHORITIES QUOTED.—Prof. A. J. Perkins, "The advantages of associating Wheat with Six-row Barley on some of our Lower North Farms." Mr. G. M. McKeown, of the Wagga Experiment Farm. L. H. Bailey, "Cyclopædia of American Agriculture." H. B. Derr, "Bulletin 443," U. S. America, Dept. Agric., 1911. Henry, "Feeds and Feeding." R. A. Moore and A. L. Stone, "Experiment Station Record," Aug., 1914, p. 134. Storer, "Agriculture in some of its relations with Chemistry." Barley breeding, "The World's Work" magazine, March, 1915. Prof. A. J. Perkins, "Journal of Agriculture," South Australia, Oct. 1914. Percival, "Agricultural Botany."

The Production of Malting Barley.

J. R. DAVIDSON.

So long as ales and beers are brewed, one of their essential constituents will be barley. The cereal is of almost world-wide production, and its importance as a grain crop will be the better appreciated by a comparison with the production of wheat in three of the leading grain producing countries for the year 1912, the latest figures obtainable :—

	Barley.	Wheat.
Russia in Europe ...	436,352,472 bushels.	621,813,850 bushels.
United States ...	217,016,000 „	708,064,000 „
Germany	153,485,416 „	160,180,258 „

In the United Kingdom the barley crop exceeded wheat by 804,896 bushels.

During the same year the figures for Australia show 3,859,116 bushels of barley, as compared with 91,981,070 bushels of wheat, whilst (significant fact) 546,177 bushels, valued at £109,466, were imported into the Commonwealth during that period.

Apart from the use of barley for brewing purposes, the feed value of the grain for various stock is not here properly recognised, though it is popular, and justly so, as a green fodder crop.

Before it can be utilised by the brewers, barley requires to be converted into malt, and the most profitable outlet for the farmer growing the crop is per medium of the maltster. The requirements of the maltster call for grain of good quality, with certain necessary characteristics. Many districts in New South Wales are well adapted for producing such barley, and it has long been a matter for surprise that in these areas the crop has not been more generally grown.

In the New South Wales Official Year Book for 1914 the Government Statistician says :—" Barley is an important crop, but at present is produced only on a moderate scale although there are several districts where the necessary conditions as to soil and drainage present inducements for cultivation, and particularly with regard to the malting varieties."

It requires no special cultivation which is not desirable with other cereals, but care is necessary in the harvesting, and the element of risk through damage by adverse weather conditions at harvest time is greater than with wheat. Still, as compared with wheat, the yield is normally much higher and the market value almost invariably well above. A comparison on these two points will prove of interest.

According to the Commonwealth Statistician the export values per bushel of Australian wheat from 1904 to 1913 were as follow:—

	s.	d.		s.	d.
1904	3	2	1909	4	2
1905	3	5	1910	4	2
1906	3	3	1911	3	6
1907	3	4	1912	3	11
1908	4	1	1913	3	9

Over the same period, for the average price of malting barley in the Melbourne market, which governs the markets for this grain in other States, the authority mentioned gives the following prices per bushel:—

	s.	d.		s.	d.
1904	3	6	1909	3	10
1905	4	0	1910	4	1
1906	4	5	1911	4	10¼
1907	4	8	1912	5	11½
1908	4	10	1913	3	11½

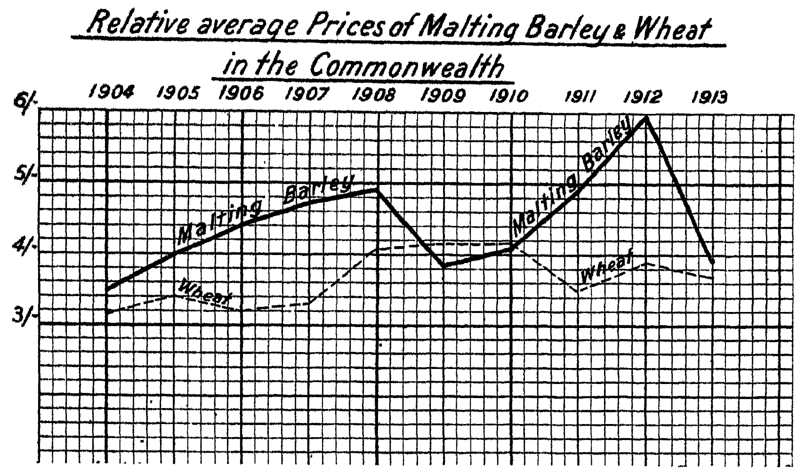
In the matter of average yield per acre in New South Wales over the same seasons, the State Government Statistician shows the following:—

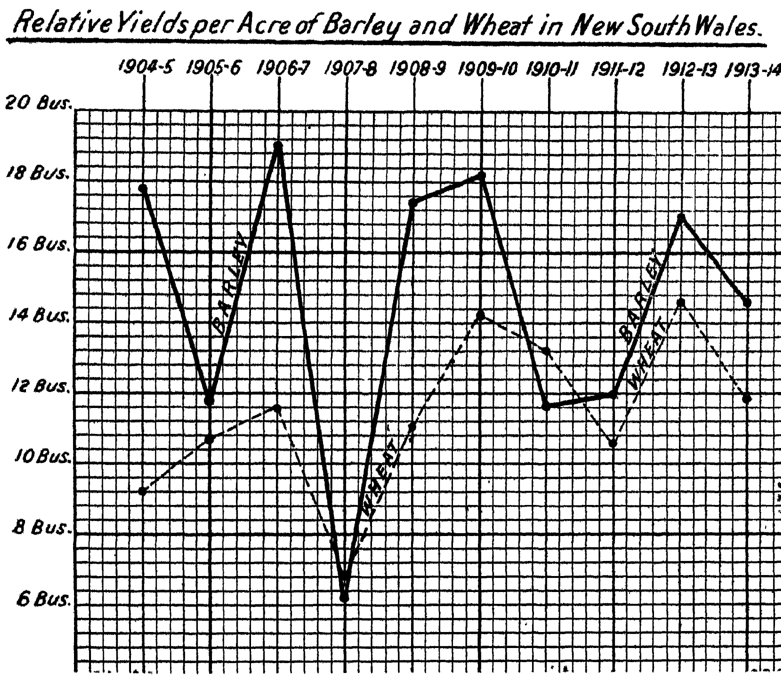
	Wheat. bushels.	Barley. bushels.
1904-5	9·27	17·9
1905-6	10·69	11·7
1906-7	11·69	19·1
1907-8	6·59	6·3
1908-9	11·11	17·5
1909-10	14·34	18·1
1910-11	13·11	11·6
1911-12	10·54	11·9
1912-13	14·56	17·1
1913-14	11·86	14·7

The same authority, speaking of barley, says:—"The average crop during the last ten years has been 15 bushels per acre, but this rate should not be regarded as characteristic, as the returns for many seasons indicate that an average crop of 18 bushels per acre may be expected under normal conditions."

Shown in graph form, on the following page, the advantages to the grower of barley over wheat, in both the above respects, are very apparent.

The aggregate barley crop in New South Wales for the season 1913-14, the largest on record, was 303,447 bushels. Distinction is not made between that utilised for malting and for feed purposes, but a reasonable estimate for the former in the season mentioned would probably be two-thirds of the total, namely, 200,000 bushels. During 1913 the antity of malt used in New





THE PRODUCTION OF MALTING BARLEY.

South Wales breweries was 809,171 bushels. This shows a deficiency in the year in question of upwards of 600,000 bushels in the local supplies of malting barley required by our maltsters and brewers. The latter imported by far the greater proportion of this in the form of malt from other States of the Commonwealth and from overseas, thus not only finding employment for a large number of hands in malt-houses outside of this State, but providing a considerable market which could be availed of by our farmers. Certainly there are not at present malt-houses in New South Wales to cope with the whole requirements of our breweries, but the fact that new maltings have been erected during the past year or two indicates clearly that capital will be readily forthcoming for expansion in this respect when our farmers produce barley in sufficient quantities to keep other new maltings employed, without the importation of barley being necessary.

The possibility of local over-production, in view of the very considerable shortage which exists in local supplies, is therefore remote, and need not occasion concern to intending growers of this crop for years to come. For technical reasons connected with the conversion of barley into malt, as well as the avoidance of risks attendant on the importation of grain, maltsters prefer locally grown produce, provided the quality, which is the supreme consideration, is satisfactory. One company has for years past offered and given farmers an undertaking to purchase their crops, assuring a satisfactory minimum price, on the one condition as to quality.

Departmental Experience with Barley.

Some instructive comparisons may be made from reports of the managers of the Experiment Farms, as recorded in the *Agricultural Gazette.* In June, 1911, Mr. G. M. McKeown, under the heading "Crops at Wagga Experiment Farm, 1910," says :—"The highest yield of Federation in the experiment plots was 34 bushels. The rest of the paddock was occupied by Firbank wheat, which returned 19 bushels 25 lb. per acre, and Kinver malting barley 37 bushels 6 lb. per acre." Also, in the same article : "Barley returned the following yields per acre :—

Skinless	22 bushels	42 lb.
Kinver	37 "	6 "
Goldthorpe	32 "	42 "
Golden Grain	39 "	21 "
Gisborne	19 "	39 "
World's Champion	17 "	43 "

The two last-named are new varieties."

In "Paddock Accounts from Wagga Experiment Farm" (*Agricultural Gazette*, September, 1912) were set forth statements of account, "showing the expenditure and returns from a farmer's point of view, assuming that in each case his paddocks had received similar treatment to that carried out at the Experiment Farm." Charges for seed, manure, ploughing, harvesting,

&c., are set out against the returns for each paddock, and the balance (or profit) given. A comparison is made below of the best wheat paddock and the only malting barley paddock shown in these accounts:—

Wheat (Federation).—Paddock No. 6, area 68 acres. Crop harvested—1,637 bushels, at 3s. 8d., or 24 bushels per acre. Gross return—£300 2s. 4d., or £4 8s. 3d. per acre. Profit—£166 7s. 1d., or £2 8s. 11d. per acre.

Malting Barley.—Paddock No. 7, area 35 acres. Crop harvested—938 bushels, at 4s. 9d., or 26·8 bushels per acre. Gross return—£222 15s. 6d., or £6 7s. 3d. per acre. Profit, £165 16s. 7d., or £4 14s. 9d. per acre.

It will be noted that, although the area of the wheat paddock was practically double that sown with barley, the profit from each was about the same, making the profit from the barley per acre almost double that from the wheat.

In the *Gazette* of April, 1913, Mr. R. W. Peacock dealt with the crops grown at the Bathurst Experiment Farm during 1912. In this year the conditions were abnormal, a very dry autumn and a cold wet winter. Mr. Peacock said:—"The cold conditions of June, July, and August, together with the water-logging owing to excess of rain, had a very marked effect upon the various crops—the oats and barleys thriving, whereas the wheats were placed at a decided disadvantage. The oats and barley crops were very good, and equal to those grown during the best of seasons, whereas the wheats were seriously affected, &c." Again, Mr. Peacock says:—"Throughout the farm, the fact that oats and barleys withstood the conditions, when sown in a dry seed-bed, better than wheat, was apparent." The yield of the best wheat paddock (Federation) was 26 bushels 57 lb. per acre, whilst the yield of Standwell malting barley was 49 bushels 15 lb. per acre, and Cape barley 51 bushels 3 lb. per acre, so that these barleys yielded almost twice as much as the farm's best wheat in this year—threefold and fourfold as much as other wheats.

Dealing with his report for the same season of 1912, Mr. Peacock, in the *Gazette* of November, 1913, supplies particulars of the returns from each paddock. The following are his figures for the wheat (for grain) paddock above referred to, and a barley paddock, in which was sown Standwell malting, Cape, and Skinless barleys:—

Wheat.—Paddock No. 10, 10·2 acres. Gross returns (including straw)—£74 6s. 8½d., or £7 5s. 9d. per acre. Profit—£38 14s. 9d., or £3 15s. 11d. per acre.

Barley.—Paddock No. 1A, 7·19 acres. Gross returns (including straw)—£79 2s. 4d., or £11 per acre. Profit—£45 1s. 7d., or £6 5s. 4d. per acre.

If the wheat had been sold at milling rates (3s. 3d. per bushel) and the barley even at feed rates (3s. per bushel), the returns for these paddocks would have been more markedly in favour of barley, viz.:—

Wheat—Profit, £12 6s. 6½d., or £1 4s. 2d. per acre.
Barley—Profit, £22 18s. 8d., or £3 3s. 9d. „

With respect to crops at the Cowra Experiment Farm, a return is published in the *Gazette* of April, 1914, by Mr. M. H. Reynolds, the Manager, showing the following comparative figures :—

Wheat (for grain).—62 acres. Yield—1,165 bushels, at 3s. 6d. per bushel, or 18·79 bushels per acre. Gross returns—£203 17s. 6d., or £3 5s. 9d. per acre.

Barley.—2 acres. Yield—69 bushels, at 4s. per bushel, or 34·5 bushels per acre. Gross returns—£13 16s., or £6 18s. per acre.

For the last season (1914–15), one of disastrous drought in Victoria and South Australia, the Government Statists of these States, in their official returns of the grain production for the season, give the following remarkable figures :—

Victoria—			
Average yield of	Wheat	1·38	bushels per acre.
„	Malting barley ...	11·79	„ „
„	Other barley ...	7·43	„ „
South Australia—			
Average yield of	Wheat	1·41	„ „
„	Malting barley ...	7·63	„ „
„	Barley (all kinds)	6·75	„ „

Comment is needless as to the respective drought-resistant properties of the two crops.

Requirements for Malting Purposes.

Below a certain standard barley is useless to the maltsters, but those already established are too anxious to secure the right class of local grain to find fault without full justification. It must be borne in mind that it is part of the maltster's avocation to be a judge of the quality of barley for his purposes, and farmers must have considerable experience with the crop before becoming similarly qualified as judges.

As the process of malting is dependent upon germination, the prime and absolute necessity in barley for this purpose is vitality—that is, its germinating capacity must not be impaired through any cause. This is the fact which the grower of barley must keep most prominently in view when growing the crop for malting purposes, and the risks of damage in this direction, right up to the delivery of his grain, are the only ones the farmer really runs, apart from absolute destruction from any such causes as fire and flood.

Damage to germinating properties may be occasioned by forces quite outside the farmer's ability to avoid, such as rain on a ripe crop, but other causes may be avoided by care on his part. Carelessness in harvesting is the most general cause of damage, and too much attention cannot be paid to this operation, whether done by reaper and binder, reaper-thresher, or stripper-harvester.

The last-mentioned method of harvesting, though the least desirable, is the one most in vogue in this State, and comments which apply in this case are largely applicable to the other methods. The machines must not be driven

too fast, and the grain must not be broken or damaged by "nibbing" or skinning. Even a comparatively small percentage of damaged corns will spoil an otherwise good sample, as, in the malting process, such damaged corns will spread mould and disease amongst the sound and healthy grains, and render the malt unsatisfactory. Barley straw is very brittle, and the crop threshes much more easily than wheat, so that danger of damage is correspondingly increased unless attention and care are devoted to the harvesting operation. Before this is commenced the machines should be properly adjusted in regard to beaters, concaves, drums, screens, &c. The hands working the machines should be specially cautioned as to the results required, and the samples being obtained by each should be frequently examined.

After being bagged the grain should not be left exposed in the paddocks without covering, as rain on the bags will almost certainly damage the contents, for barley absorbs moisture much more readily than wheat. For the same reason it should always be stacked off the ground, and in course of transit, or when stacked at railway stations, should always be covered by tarpaulins.

Apart from freedom from damage, the maltster's other important requirements in barley are plumpness, mealiness, uniformity, and good colour, qualities all more or less dependent upon the soil, season, methods of cultivation, and weather at harvesting. At the same time much in regard to these rests with the judgment and attention of the farmer at the time the crop is ripening.

For instance, unless it is to be cut and stacked, it should not be harvested on the green side—it should be fully ripe, but not over-ripe. If it is not ripe, or harvested when the grain is moist from rain or heavy dews, sweating and consequent discoloration, with an impairment of its germinating properties, will almost certainly take place in the sacks. Should the crop not have ripened evenly, any sacks containing grain not fully matured mixed through that which is ripe, should, if possible, not be sewn up immediately or stacked, but the sacks should be stood on end in a dry place in such a manner as to permit of the free passage of air between them until the grain is thoroughly dry. Better still, if practicable, such grain should be spread on covered floors and turned occasionally until it is so dry that there is no danger of sweating when it is bagged. In some countries this practice is invariably followed with all the barley after being threshed.

If a crop is harvested before thoroughly ripe, the grain will be "flinty" or "ricey," and not mealy or floury in character when broken, as is required in a prime malting sample.

All possible care should be exercised to see that the grain is reasonably uniform in size and condition. If the harvesting machines used do not permit of the screening of thin or unfilled grain from the bulk, in order to obtain best prices from maltsters the harvested barley should be passed through a grader. There should be no avoidable proportion of thin grain in

a sample to be offered for malting purposes. Even barley of small size, so long as it is fairly well filled and uniform, and otherwise suitable, is preferable to a sample which contains a quantity of bold, plump grain, but on the whole is uneven.

Rather than the crop should be threshed so hard that the husk or skin is partially removed, it is better that the awns or beards should not be entirely dressed off the grain; but it must not be understood that maltsters, and much less persons buying for feed purposes, wish to have barley delivered in such a condition that a large proportion of awns remain. When harvesting or threshing is being carried out, the machines should be set so as to thresh off as much as is possible of the awns without the grain being hit too hard. Should there be included in a line of barley any undue proportion of straw, unthreshed heads, or long awns, difficulty will probably be found in disposing of it, or a risk run of rejection on delivery, as ordinary screening machines will not satisfactorily treat such grain without a heavy loss being occasioned.

If a portion of the crop is poorer than the remainder, or not so ripe, or unevenly ripe, this should be harvested separately, and not allowed to get into the same bags as the better portion, as even a small proportion of this, if mixed through good grain, may spoil the lot for the maltster.

Colour is always an important consideration, and it should be the aim of the farmer to preserve the bright natural light yellow of undamaged barley.

Weevil is a bugbear of the maltster, but it should not be necessary to caution the farmer against using old, uncleaned bags which have previously contained weevilly grain. If weevil has got into barns or stores it is not only on account of barley that the pest should be thoroughly rooted out.

Before concluding, it may be mentioned that what is usually referred to as "Malting" or "English" barleys are those of the two-row (or Chevalier type) varieties. But six-row (or Cape type) barleys are very largely used for brewing purposes, and are therefore malted. Hitherto, so-called "Cape" barley has been little, if at all, bought by maltsters in New South Wales, mainly due to lack of facilities. With, however, the extension of existing malt-houses will come a demand for "Cape" barleys, and, although this class of grain does not realise as high a price as two-row barley, it is usually a heavier cropper, and not so liable to damage through careless harvesting. Six-row barley must, for malting purposes, be of good quality, well filled, and of bright colour. It is very necessary to have good seed, and trials are being made with promising varieties.

The writer has in this article endeavoured to show the scope for increasing the production of barley for grain in New South Wales, and at the same time the requirements of the buyers who will pay the best price, viz., the maltsters. These may appear somewhat exacting, but the difficulty of meeting the same is more apparent than real, if reasonable attention to harvesting is given by the farmer, and the main results desired are borne in mind. Success with the crop means a very fine reward for trouble taken, as the

experience of many careful farmers, and the figures given early in this article, attest. The results over a number of years will prove that the failure to produce grain sufficiently good for malting purposes in an occasional season still leaves a credit balance in favour of malting barley as compared with wheat.

A Grower's Advice.

In the course of an interesting letter, describing the advantages and disadvantages of growing malting barley, Mr. C. Jeffries Britten, of Tamworth, makes this valuable suggestion:—

"I recommend farmers to sow one quarter to one-fifth of their cultivation area with barley; that means that they will have sufficient harvesting machinery to get the crop off in less than a week, and that is important, for the grain must be dead ripe before they start, and after it has been ripe for more than a week the heads fall off the stalks very easily. I have seen many instances of farmers getting a gross return of £7 or £8 per acre off their small area of barley, as against £5 or £6 per acre off their larger area of wheat: next year they think it is a wise thing to sow all with barley, and, not having sufficient machinery to harvest the crop in a week or ten days, they are disappointed with the result, and give up barley-growing in disgust."

THE GROWING OF BARLEY IN CALIFORNIA.

ONE of the most startling features in connection with the agricultural production of the State of California has been the way in which barley has forged ahead until it equals in acreage and exceeds in yield and value all other grain crops combined. Whereas barley had in 1914 no fewer than 1,941,506 acres sown, wheat followed a long way after with 725,214 acres, while oats came third with 315,975 acres.

The remarkable change in the positions of the cereals may be indicated in the following summary:—

	1862.	1910.	1914.
	Acres.	Acres.	Acres.
Maize	17,339	51,935	89,144
Wheat	361,351	478,637	725,214
Rye	1,415	7,027	24,320
Oats	36,607	192,158	315,975
Barley	223,217	1,195,158	1,941,566
Potatoes	3,624	72,799	66,470
Hay and Forage (including lucerne)	250,464	2,049,213	2,533,347
Total	894,017	4,046,927	5,696,036

In 1914 the yields of the three main cereals crops were:—Barley 42,060,000 bushels (of 48 lb.), oats 7,700,000 bushels (of 32 lb.), and wheat 6,800,000 bushels (of 60 lb.).

In view of the similarity between the climatic conditions of California and New South Wales, there should be no doubt about this State being able to raise at least sufficient barley for its own requirements.

Practical Irrigation-farming in Australia.

WITH SPECIAL REFERENCE TO FRUIT AND FODDER CROPS.

[Continued from page 804.]

A. M. MAKINSON, B.A., Organising Inspector, Agricultural Bureau.

PART IV.

Grading and Channel Making—The Use and Misuse of Irrigation-water.

WHEN a farm has been properly laid out, divided into blocks, and the position of channels and ditches, methods of irrigation, and length and direction of water-furrows have been determined, the land should be ploughed and graded, and the routes of channels and ditches raised, if necessary, before the latter are constructed.

A preliminary Ploughing.

On many soils a deep subsoil ploughing before planting is of great and lasting advantage, particularly in heavier classes of land, where there is a crust not far from the surface, or in land about to be planted with vines on resistant stocks; the loosening up of the subsoil enables the roots of trees and vines to extend freely and take full advantage of the available moisture and plant-food. In the early days of Mildura traction engines were used for this work, and were found very effective. Growers say that fruit-blocks in Mildura still show the benefit of the deep rooting up they got some twenty years ago. Where horses are used to draw a subsoil plough, from eight to twelve good draughts are necessary to do effective work (at a depth of 20 inches), according to the class of soil and the type of plough used.

It is not always so necessary to subsoil light sandy country for fruit-trees as it is for resistant vines, but in any case the land should be turned over by an ordinary mould-board plough to a depth of from 8 to 10 inches before planting, so that the fertile soil on the surface may be buried deeply enough to be maintained in a constant state of moisture where the roots can always feed upon it.

Grading.

Grading is a process that should be resorted to sparingly, and, as has been pointed out in a preceding article, land which requires a great deal of grading should not be selected for an irrigation farm. Heavy grading entails the removal of much surface soil, which is richest in plant food, from the higher parts of the land. The higher parts are thus left impoverished, and although

the hollows may be enriched, a block of land which has been heavily graded will always present a piebald appearance, producing poor crops where the surface-soil has been removed, and perhaps over-luxuriant foliage where it has been deposited. Where much grading is unavoidable, this result may in some instances be obviated by disturbing the surface-soil as little as possible on the high parts and filling in the hollows with surface-soil taken from somewhere outside the area to be planted, or by temporarily removing the surface-soil from the higher parts into heaps, and replacing it when the hollows have been filled in with soil taken from underneath; either process is, however, likely to be somewhat expensive.

While grading is in progress levels should frequently be taken over the ground; if this is done it will be easy to judge the effectiveness of the work, and over-grading and unnecessary work will be avoided. It sometimes happens that it is necessary to devote a good-deal of time to shifting earth from one particular spot and dumping it in another, and in such a case the scraper will of course travel by the shortest distance between the two places; but in doing ordinary work it will be found an advantage to travel the scraper backwards and forwards approximately in the direction that is to be taken by the water-furrows, picking up earth and spreading it as may be required. Where a hollow is to be filled in, it must be remembered that the loose soil will settle when it gets the water, and allowance must be made for this. The cost of grading may be anything up to £2 an acre, but should not exceed that figure.

Grading should be done early in the autumn, and the land pegged out for planting as soon as it is finished. Where the soil is loose and liable to drift, a crop of some sort, barley for preference, should be drilled in beside the channel routes and between the rows of pegs, leaving a strip bare along each row where the trees or vines are to be planted. This will prevent the soil from drifting, and may be cut for hay in the spring.

The Buck-scraper.

Few men become proficient in the use of a four-horse buck-scraper without a good deal of practice, and it will not generally pay the new-chum irrigation farmer to attempt this work himself, if he can get an experienced hand to do it for him. The amateur will do unnecessary work as a rule, and so waste a good deal of time and horse feed.

It is most important that the two chains that connect the scraper with the swingle-bars should have exactly the right draught, so that the scraper will balance properly. If these chains are adjusted too far back, it will take the strength of a strong man at the handle to prevent the scraper from burying itself, and if too far forward it may take two men to tip the load. When they are properly adjusted, the man at the handle should be able to regulate the depth of cut to an eighth of an inch, and spread the load with the same nicety, and without great effort. A steady, even team is very necessary for buck-scraping—steady horses will help a man with his work, and he will

be able to help them in theirs. One sometimes sees two men at this work together, one man driving the team and another handling the scraper. There should be no necessity for this, except perhaps to break in a raw uneven team new to the work.

The handle of the scraper should be held in the right hand, or supported on the right arm or shoulder, and the reins in the left hand, the handle being raised or lowered to increase or diminish the depth of the cut; in spreading, the handle should be let forward or pulled back by the handle-rope according as a greater or lesser thickness of earth is required to be spread. If the load has to be taken some distance before being spread or tipped, the scraper should "carry" it without a hand on the handle. If the scraper will not "carry," either the chains are not properly adjusted or the rockers are wrongly shaped. It may be remarked that scrapers made for dam-sinking and other rough work are often useless for grading.

Channel Making.

In laying out the course of a channel it is desirable that there should be as little made ground as possible in its construction; in other words, that the bottom and sides should, when possible, consist of solid ground in its natural state, and not of built-up earthwork; the average depth of the bottom below the natural surface should at all events be not less than two-thirds of the depth of the channel. When the route of a channel has been determined levels should be taken at intervals of a chain throughout its length, the staff being held on pegs driven in level with the surface. Holes may then be dug alongside these pegs to the necessary depths, and pegs, the tops of which will mark the line and level of the bottom of the channel, should be driven firmly into the ground in the bottom of these holes. The work of "forming" the channel may then be proceeded with to the pattern of a wooden template made to the shape and size best adapted to the nature of the soil; the amount of water to be used, and the fall to be given to the channel, in accordance with the directions in the paragraphs that follow. When a channel is required to carry water from point to point, care should be taken to make the fall perfectly even, and, in the case of a head-ditch, as even as the contours of the land it has to serve will permit.

Two Cross-sections for Earth Channels.

Figure 12 shows a suitable cross section ("A") for all sizes of earth channels *in a firm soil* up to the largest likely to be required on an irrigation farm; it is one in which the width of the bottom, or bed-width, equals the depth, and the side slopes are one to one.

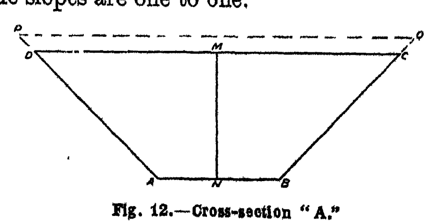


Fig. 12.—Cross-section "A."

To construct a template to cross-section "A" for any size of channel up to a depth of 4 feet, first find from diagram I (according to instructions printed thereon) the depth that will be required for the channel to carry the amount of water to be used* at the particular fall that is to be given to the channel. When the required depth has been found cut two battens equal to it in length, take one of them (AB) for the bottom piece and fasten one end of the other (MN) to the middle of AB, so that MN is at right angles to AB. Cut a top piece (DC) three times the length of AB, and fasten the middle of it to M, so that DC is at right angles to MN, and therefore parallel to AB. Join AD and BC with battens projecting at D and C. DABC is the wetted cross-section required, DC being the level to which the water will rise; the battens projecting at D and C must accordingly be cut off from 4 to 6 inches vertically above D and C (to allow for a margin against overflow) at P and Q. Join P and Q and the template is complete.

In lighter soils, or where the size of the channel to be made is large enough for the excavating to be done with a buckscraper or scoop, cross-section "B," in which the bed-width equals half the depth and the side-slopes are 1½ to 1, will be found more suitable, because lighter soils will better retain the easier slope, and it will be more convenient for the work of man and team.

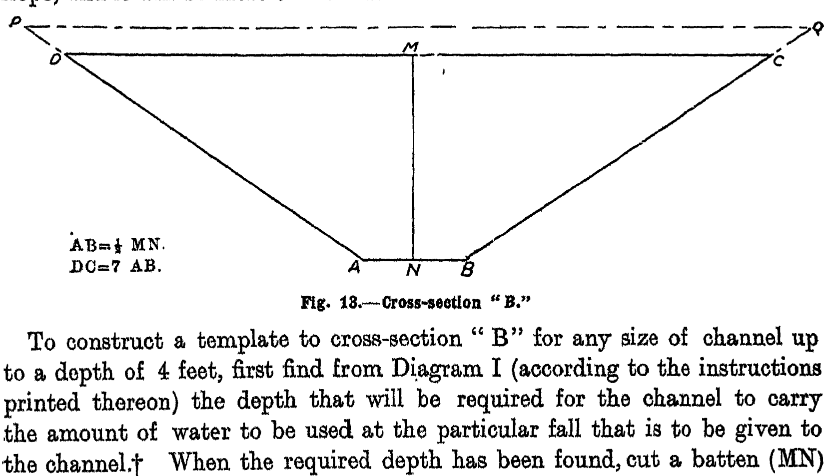


Fig. 13.—Cross-section "B."

To construct a template to cross-section "B" for any size of channel up to a depth of 4 feet, first find from Diagram I (according to the instructions printed thereon) the depth that will be required for the channel to carry the amount of water to be used at the particular fall that is to be given to the channel.† When the required depth has been found, cut a batten (MN) equal to it in length, and another (AB) half its length, and fasten one end of MN to the middle of AB, and square with it. Cut a top-piece (DC) seven times the length of AB, and fasten the middle of it at M, so that DC is at right angles to MN. Join AD and BC with battens projecting at D and C.

* For a method of measuring any stream of water, see page 944.

† Diagram I is drawn for cross-section "A," and is not strictly accurate for cross-section "B," for though the areas of the two cross-sections are the same at a given depth, the hydraulic radius $\frac{\text{area}}{\text{wetted perimeter}}$ of "B" is slightly less than that of "A." The inaccuracy of Diagram I in regard to cross-section "B" is, however, inconsiderable, and any error in its use for that cross-section will be fully covered by allowing an extra inch to the length of MN, when starting to make the template. Diagrams I and II are based on Kutter's formula.

To find the required bed-width, first find the horizontal line on the left-hand side of the Diagram representing the stream of water to be carried by the channel, to within 10 cubic feet per minute. Follow that line to the curve representing the fall of the channel. From that point follow the vertical line to the scale at the bottom of the page, which will give the required bed-width in inches.

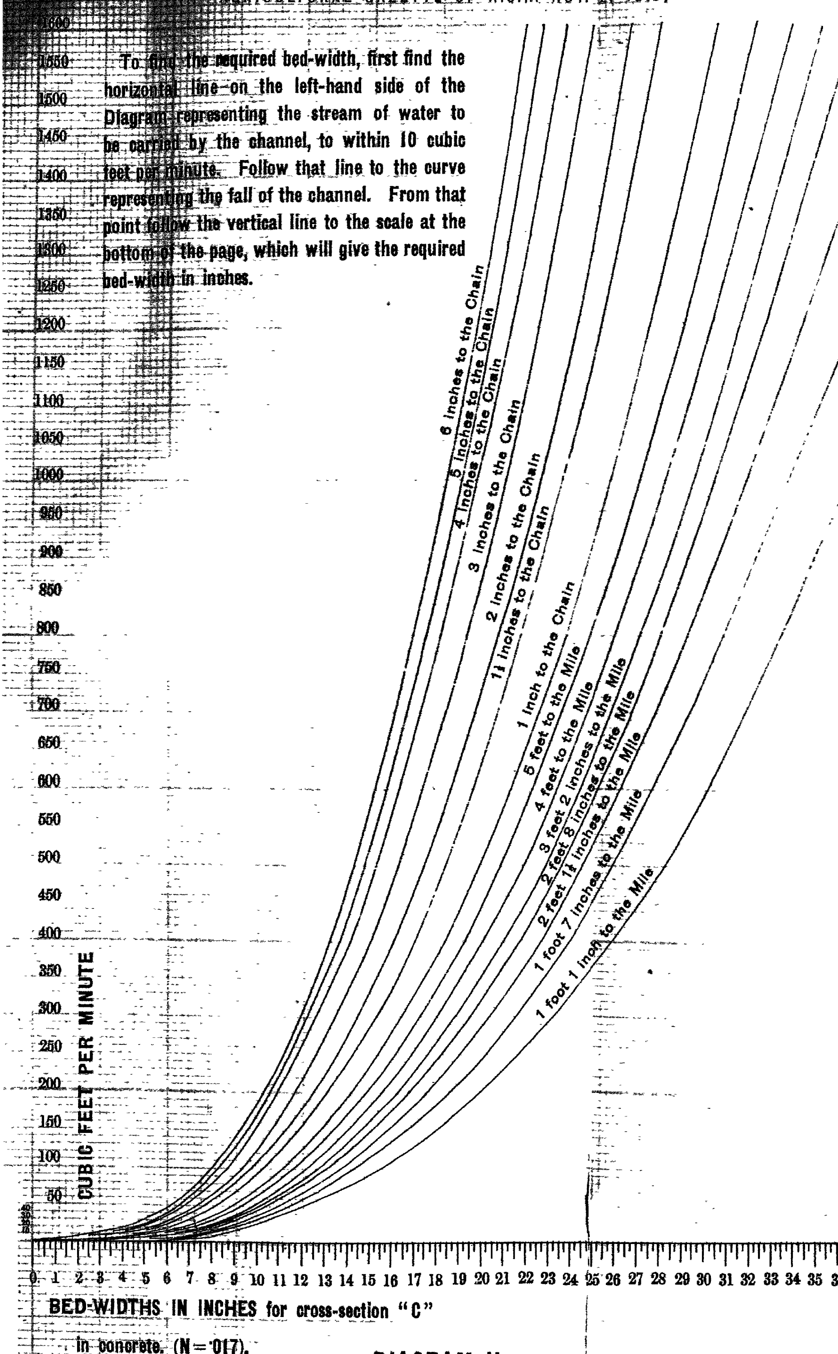


DIAGRAM II.

DABC is the wetted cross-section required, DC being the level to which the water will rise; the battens projecting at D and C must accordingly be cut off from 4 to 6 inches vertically above D and C (to allow for a margin against overflow) at P and Q. Join P and Q, and the template is complete.

From Diagram I the size of earth channel required to carry any stream of water up to 1,600 cubic feet per minute (enough for 800 acres of lucerne) at different falls up to 48 inches to the mile may be found. A fall of 6 feet to the mile in the steepest grade at which it is safe to run a large stream of water in an earth channel, and at that grade a stream larger than 1,000 cubic feet per minute is liable to scour. Small streams may be carried by earth channels in clay soils at a fall as steep as 1 inch to the chain.

A Cross-section for Concrete Channels.

The period at which concreting becomes necessary depends altogether on the class of country to which the farm belongs. In more or less level country, composed of heavy soil, it may be postponed for some years, and in such a case the average farmer will do well to leave it alone till he can get some profit from his land, and can afford it. But unconcreted channels or ditches which are much used should be watched for signs of seepage, and concrete put in if any appear. In light sandy loams, where channels or ditches have much fall, they must be concreted before they can be used; a concreted head-ditch is always much more satisfactory to irrigate from, and is less expense to keep in order, for earth ditches afford a harbour for couch grass, cobbler's pegs, and other weed-pests.

It should be noted, however, that the surface of land which has never before been irrigated is liable to settle in places during the first year or so of irrigation, and it is often desirable, where a channel of any size is to be constructed, to postpone concreting for a year or two for that reason. If the soil where a channel or ditch is to be put down is dry, it should be well soaked with water running in two or more furrows before concrete is put in; this is particularly important, and requires to be very thoroughly done where a channel or ditch is to be laid on a raised bank, or made-ground of any kind, as the latter always settles considerably. After forming, the levels of the pegs should be checked, as they are liable to be disturbed in the process.

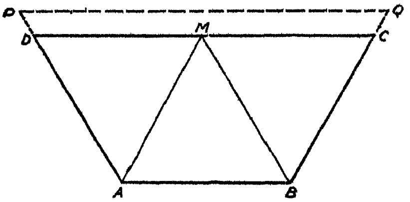


Fig. 14.—Cross-section "C."

Fig. 14 shows a suitable cross-section ("C") for all sizes of concrete channels up to the largest likely to be required for an irrigation farm. It is one in which the bed-width is equal to the sides, and is half the width of the top. The side slopes are ½ to 1.

To construct a template to cross-section "C" for any size of channel up to a bed-width of 3 feet, first find from Diagram II (according to the instructions printed thereon) the bed-width that will be required to carry

the amount of water to be used at the particular fall that is to be given to the channel. When the bed-width has been found cut three battens equal to it in length, and join their ends to form the equilateral triangle AMB. Cut a batten (DC) twice the length of AB and fasten the middle of DC at M, so that DC is parallel to AB. Join BC and AD with battens projecting at C and D. DABC is the wetted cross-section required, DC being the level to which the water will rise, and the projecting battens must be cut off at from 2 to 4 inches above DC (to allow for a margin against overflow) at P and Q. Join P and Q, and the template is complete.

The side-slopes of cross-section "C" would be too steep for channels in earth, but when concrete is used this objection does not apply. Cross-section "C" is to be preferred to cross-sections "A" and "B" for concrete channels and ditches, because:—

(1) It gives the largest area—that is to say, water-space—for the least amount of concrete.

(2) Its greater depth in proportion to its wetted perimeter* gives it the further advantage of a greater hydraulic radius and consequent increase in the velocity of the stream and the amount of water that the channel will carry.

APPROXIMATE amount of concrete (mixed in the proportions of 3, 2 and 1) required for the construction of 1 chain of a channel or ditch, 3 inches thick to the pattern of cross-section "C."

Bed-width of Cross-section.	Allowing for increase in height of side slopes by—	Quantity in Cubic Yards.			
		Rubble.	Sand.	Lime.	Concrete.
ft. in.	in.				
0 9	3	1·2	0·8	0·4	2·0
1 0	3	1·5	1·0	0·5	2·5
1 3	3	1·8	1·2	0·6	3·0
1 6	3	2·1	1·4	0·7	3·5
1 9	3	2·4	1·6	0·8	4·0
2 0	3	2·7	1·8	0·9	4·5
2 3	4	2·85	1·9	0·95	4·75
2 6	4	3·3	2·2	1·1	5·5
2 9	4	3·5	2·3	1·15	5·8
3 0	4	3·7	2·4	1·22	6·1

Lime-burning.

In districts where there is limestone in the subsoil or limestone outcrops and a fair supply of good timber fuel, it will usually pay the irrigation farmer to burn his own lime for concrete channels, either in co-operation with other farmers or on his own account. In some districts it would pay settlers to erect a properly constructed lime-kiln on co operative lines to burn lime for concrete channels, buildings, and for use as a fertiliser. Where a kiln is not available the stone may be burnt in a square or rectangular pit, sunk,

* The perimeter is the sum of the bed-width and sides.

preferably in a clay soil, with a passage of access to the bottom, as shown in the illustration. A pit 12 feet x 8 feet x 8 feet deep will be large enough to burn about 14 yards of lime at one time, which should be enough for the needs of the average 50-acre farm. (See Fig. 15). In limestone rubble

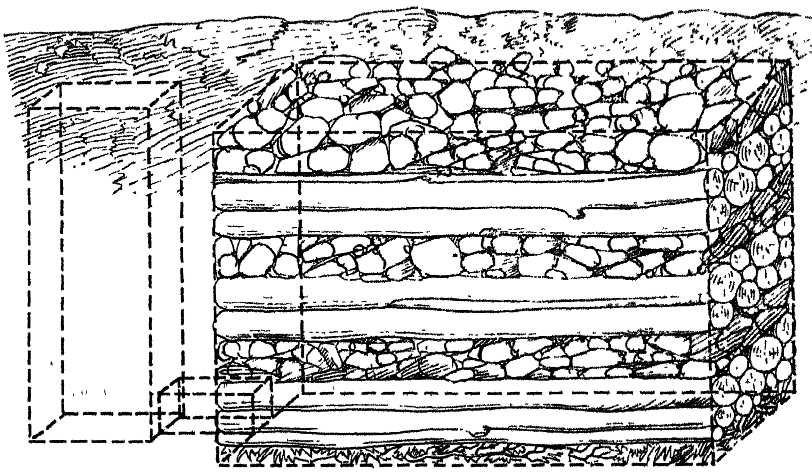


Fig. 15.—Diagrammatic sketch of Lime-kiln.

country the stone may be raised and screened twice, first through a coarse screen by means of which the large stones suitable for lime-burning are separated from the small stones suitable for gravel, and from the dirt, after which the gravel and dirt may be separated by means of a smaller screen.

To burn the limestone a layer of dry sticks and brush about 6 inches thick should first of all be spread in the bottom of the pit and on top of that a layer of box logs (preferably green and dry mixed) 10 feet long and from 1 foot to 2 feet in diameter; on this layer of fuel a layer of limestone may be laid, followed by further alternate layers of fuel and limestone until the pit is filled, each layer of limestone being from half to two-thirds of the thickness of the layer of fuel beneath it. When the pit is filled a fire may be started at the bottom of it through the passage of access which may be left open or closed according as more or less draught is required. If there is any risk of rain a covering of some sort should be rigged over the pit. Lime burnt in this way will take about four days to burn; it will take a larger amount of fuel in proportion to the quantity of stone burnt than would be necessary in a properly constructed kiln, but this matters little where fuel of the right quality is plentiful. The writer would not recommend anything but solid box or clean mallee roots which have been washed by a winter's rain after being taken from the ground. Care is necessary that no dirt goes into the pit with either the stone or the fuel; if it does it will not only adulterate the lime but will prevent the stone from burning properly.

The Mixing of Lime Concrete.

Three of gravel, two of sand, and one of lime are the proportions for lime concrete in general use. The sand should be clean, sharp and free from loam, the lime fresh and hot, the gravel of a diameter not more than a third of the thickness of the concrete to be laid.

The rubble, sand, and lime may be mixed dry on a board, turned over three or four times with shovels, and water added gradually until the whole is sufficiently wetted, after which it should be turned again two or three times with picks or "mixers," and may be left in a heap till the following day, and turned again with picks or mixers before laying. The reason for leaving the mixture in a heap for twenty-four hours or so before laying is to allow any lumps in the lime to slack thoroughly before the concrete is laid. If unslacked lumps are laid with the concrete they will be liable to burst it after it has set. A period longer than twenty-four hours should not be allowed to elapse between mixing and laying.

Another method of mixing is to mix the rubble and sand dry, slack the lime in water, and add it to the rubble and sand with the water. This method ensures the immediate slacking of the lime, but causes some difficulty in adding the right proportion of both lime and water; if it is used there must be no delay in adding the lime and water to the other materials *while it is slacking*, and the concrete should be laid as soon as it has been thoroughly mixed.

When the concrete is being laid, the sides should be put in first and rammed, and the bottom put in immediately afterwards, and the whole rammed as soon as it is laid. It should be again rammed and trowelled on the following day, and hot lime or cement wash may be applied with advantage when the concrete is about half set. Where cross-section "C" is used for a concrete channel with a bed-width of 2 feet or more, it may be necessary to lay the sides in two tiers or sections, supporting the lower tiers with boards placed against each side with struts between them while the upper tiers are being laid. In such a case the lower tier must not be allowed to get too dry before the upper tier is laid or there will be danger of a break where the two tiers join.

The Use of Cement for Channels and Head Ditches.

Cement is very useful for repairing lime-concrete channels and ditches where they crack or show signs of wear. It is especially useful as a wash, which may be supplied as such, mixed with water to the consistency of a thick soup, with a white-wash brush. Cement is, however, too expensive an ingredient for the irrigation farmer to use in place of lime in the construction of substantial channels or ditches.

Sluice-boxes are set in a head ditch as it is formed, one for every pair of water-furrows; they may be made from 2 or 3 inch galvanized down-piping, each box taking 2 feet of pipe. Usually one end of the pipe is hammered

To find the number of cubic feet per minute passing over a sill one foot wide, first note the level of the surface of the water on gauge "A," and measure with a foot rule the depth in inches from the same mark on gauge "B" to the top of the sill. From the point representing that depth on the scale at the bottom of this Diagram, follow the nearest vertical line upwards to the curve, and from that point follow the nearest horizontal line to the left-hand side of the Diagram, where the number of cubic feet per minute passing over the sill may be read. Where the sill is two feet wide, this number will be doubled, where it is three feet wide trebled, and so on.

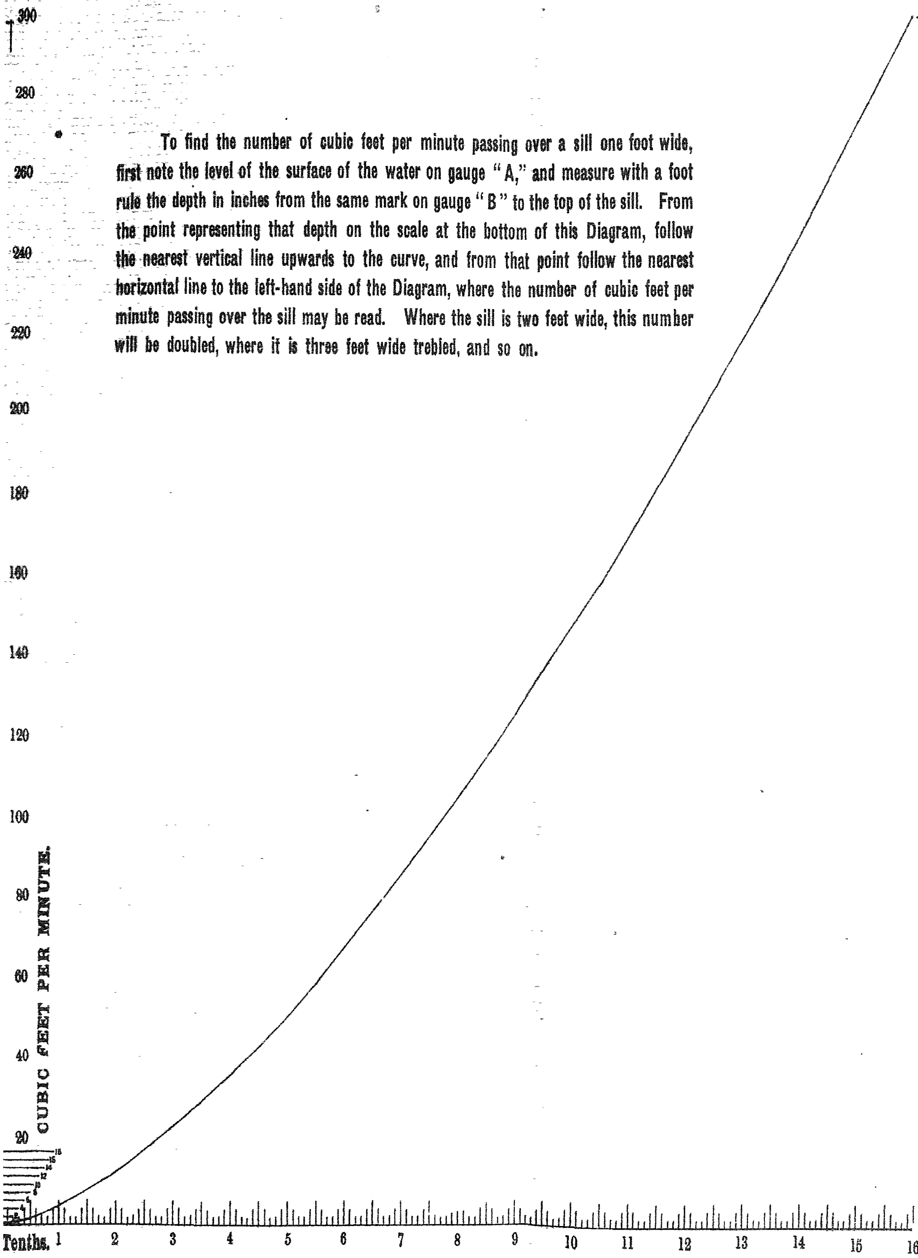


DIAGRAM III.

square, and the edges of the square turned outwards to take a slide; they may be made on the farm by a handy man, or obtained from a tinsmith at the cost of about 1s. each.

When a head-ditch has a steep fall it is necessary to check the water at each sluice-box. A piece of board shaped and embedded in the concrete is often used for this purpose, but is not very satisfactory. The better plan is to slope the bottom of the ditch from a point 2 feet above each box at a steeper grade, to form a step rising 3 inches, at an angle of about 120 degrees to the normal grade, immediately below the box, as in Figure 16. The water will then flow evenly on the surface, and will carry straight down the ditch anything that might obstruct the boxes.

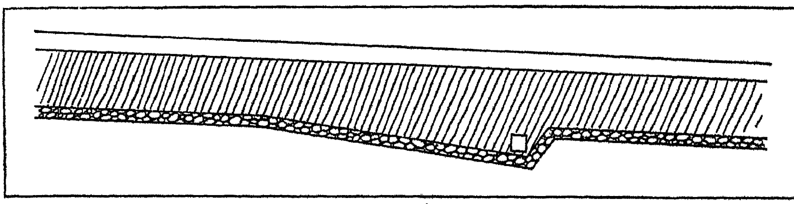


Fig. 16.

Concreting should be done in the winter time if possible, and a concrete ditch should be allowed to get thoroughly dry before water is allowed to flow into it.

THE USE AND MISUSE OF IRRIGATION-WATER.

That a farm may be irrigated successfully and without subsequent harmful results to the soil it is necessary—

(1) That the land be suitable for irrigation.*
(2) That the farm be properly laid out for irrigation.†
(3) That the water be always under control while an irrigation is in progress, and be applied to every part in the quantity required by such part *and no more.*

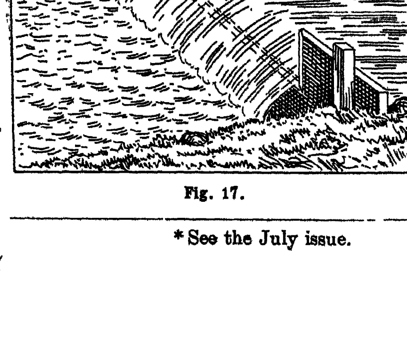


Fig. 17.

Few irrigators have more than a vague idea as to the quantity of water they use, the reason being that, except on areas where there is a meter for every farm, they have no simple means of calculating it. This fact alone is responsible for much of the slovenly irrigating which has been and still is practised in this country, and which has at times been the cause of much loss and damage. Whatever the source of the water, the irrigation farmer has to pay for it, and should know

* See the July issue. † See the August issue.

whether he is getting what he pays for; he should also know how much water he has used after an irrigation, and be able to enter the number of acre-inches in a book, in the same way that he enters up the points registered in the rain-gauge. Any stream of water may be measured, if backed up so that part of its surface is practically without movement, by allowing it to flow through a rectangular opening over a horizontal sill 1, 2, or 3 feet wide according to the size of the stream as shown in Fig. 17.

A gauge showing tenths of an inch should be put in where the water is still (or nearly still) as at A, and another, exactly similar and showing the same levels, alongside the sill at B. This latter gauge will show the level to which the still water has risen on the other. By measuring the depth from that level to the top of the sill the amount of water in cubic feet per minute flowing over the sill may be found immediately from Diagram III.

Where a water-meter is not available, an irrigation farmer may make a small tank or short length of large channel where he gets the water delivered to him, and construct a permanent sill that can be raised or lowered, 1, 2, or 3 feet wide, according to the amount of water he uses; he will then always know how much water he is using and be able to regulate the stream to a nicety.

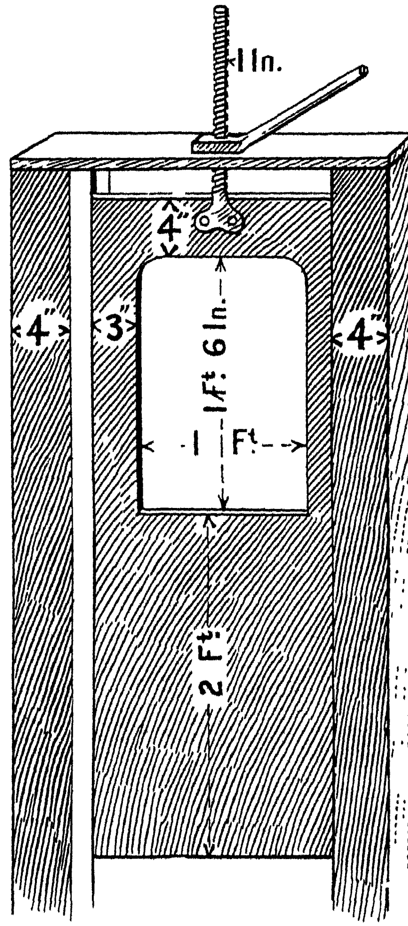


Fig. 18.

A piece of boiler-plate with a rectangular piece exactly a foot wide cut out of it makes a good sill. It may be fitted tightly into grooved wooden uprights so as not to leak, and may be regulated by means of a screw, as shown in Fig. 18.

Irrigation of Vines and Fruit Trees.

For irrigation by the furrow-system two or three furrows are usual between rows of vines, and three, four, or five between rows of trees. The amount of water to be allowed to each furrow varies from 1 to 5 cubic feet per minute, and depends on the fall, the length of furrow, the absorbent

qualities of the soil, and the amount of moisture it already contains. The less fall the furrows have the more water they must be made to carry; for this there are two reasons :—

(1) The greater volume and depth of the water increases its velocity, and

(2) The deeper the water is in the furrow, the less there is of it proportionately exposed to the earth and absorbed by it.

For converse reasons the greater the fall the less the amount of water that must be allowed to the furrows. From this it is apparent that a block in which the grades are steep will take longer to irrigate than one in which they are more level; this does not mean that it will take more water, but that it will take longer to absorb the same amount of water. It is necessary to emphasise this point, because there are settlers who calculate the efficiency of an irrigation solely by the number of hours the water is kept running on a block. This is only less absurd than the practice of those who will take all the water they can get; for while one block may absorb a 6-inch watering in twenty-four hours, another perhaps alongside it may take forty-eight hours or longer to absorb the same amount, simply on account of a difference in the grades.

The steepest grade at which water can be run in a furrow without scouring is about 10 inches to the chain, but this is a good deal steeper than is desirable.*

With regard to scouring, it should be well understood that increasing the volume and depth of water running in a furrow (as in a channel) increases its velocity, and consequently the liability of the furrow to scour. When turning the water into furrows it will be found a good rule to let it run quickly through each furrow for a few minutes to let it find a bed for itself, and to make sure that there is nothing in the furrow to block its way; it may then be regulated so as to give the land sufficient water in anything from eighteen to forty-eight hours according to the grades and the dryness of the soil, but *the water should not take longer than half the time it is kept running in a furrow to reach the end of it*, and when it gets there, should be regulated so that the merest trickle runs to waste. It would be desirable, of course, to have the water soaking into the *whole length* of the furrow from the time when it is turned into it until it is turned off; but this is not practicable, and the most that can be done is to get the water through as soon as possible without scouring or flooding, and then *regulate it to the amount that the soil will absorb, with a minimum of waste.*

The number of irrigations required by the fruit-grower and the periods at which they should be applied depend largely on the season, and also upon thoroughness of cultivation; during a wet winter fruit trees will not need water, but during a dry one an irrigation is highly necessary—much more so

* The grades desirable for different lengths of run were given in Part II.

that is generally supposed. It is true that much more moisture is taken out of the ground in the spring and summer time, and that it is then that most water is needed, but it is none the less important that moisture should not be lacking in winter when the trees and vines are resting and preparing for a fresh effort. The soil should in fact be kept *continuously in a certain state of moisture*—that is the business of the irrigationist—too much will be as harmful as too little, as many of the pioneers in the older settlements have found to their cost in the past.

The Effect of Careless Irrigating.

If the reasons for such failures as have been made by fruit-growing irrigationists in Australia to make their properties payable propositions, were sought out and tabulated, the "misuse of water" would be found if not the principal one, at all events high up on the list. There are in most of our irrigation areas fruit-blocks, some of them abandoned, that are known as "wet blocks"; these blocks have become water-logged through injudicious irrigating or insufficient drainage, or both. In one of them, seepage starting in a spot where surplus water has been allowed to accumulate, its progress marked by dead and dying vines and fruit trees, slowly spreads right over the block, and perhaps to others adjoining, if stringent measures are not taken to check it. In many of these blocks deep shafts have been sunk, sometimes with success and sometimes without, in the hope of finding a sand-drift, perhaps a 100 feet beneath the surface, by which the surplus moisture may be drained away.

This trouble is nearly always avoidable, even on land where the natural drainage is poor, by the even distribution of water in sufficient, but not more than sufficient, quantities, and by proper attention to cultivation. Mistakes, no doubt, were made in the laying out of many "wet blocks"—mistakes against which the reader already has been warned—which have made the land difficult or impossible to irrigate properly; but there are many "wet blocks" the spoiling of which has been due to careless watering pure and simple.

It must not be thought that irrigation is all done on the surface, or that it is finished when the water has been cut off from the head-ditch, and has ceased to flow in the furrows; the water may be moving underground for days afterwards, and this movement should be studied by noting the difference in the amount absorbed in different parts of the farm and the time it takes to irrigate them, by sinking holes before and after irrigation.

There are patches of land which will take, apparently, almost any quantity of water, where water will simply pass through the soil and lodge somewhere else; there are others, notably in Mallee country, where though the soil may be perfectly dry, water will run for hours in a furrow without penetrating more than a couple of inches; and others again which will hold the water for a period, after which it will suddenly disappear, where if a 3-foot hole

is sunk a fortnight after an irrigation a foot of water will rise in the bottom of it, while in a similar one dug a week later the ground may be found almost dry. The irrigationist must, therefore, study each block individually, and learn to irrigate it in such a way that every part will get the water it requires, and no more. A "wet" block may be cured as a rule by means of draining tiles, or in places where there is no possibility of surface drainage by sinking a shaft to a sand drift in the manner indicated above; but a good many "wet" blocks might be cured simply by the careful and judicious use of water and by thorough cultivation. If it is evident that a patch of ground is getting water *below the surface* which was intended for other parts of the block, it should be given less *on the surface, i.e.*, given only one irrigation while other parts get two or three, and in some cases, left unirrigated altogether. If such a patch shows near the head-ditch or midway down the rows it will be necessary to get water past it to irrigate the land at the far end of the rows. This may be done by making a small temporary earth ditch of one of the furrows higher up the block, from the head ditch to a point past the wet patch (or better still by laying removable lengths of 6-inch down-piping on the same block), and taking the water from that point across the furrows as required (see Fig. 19).

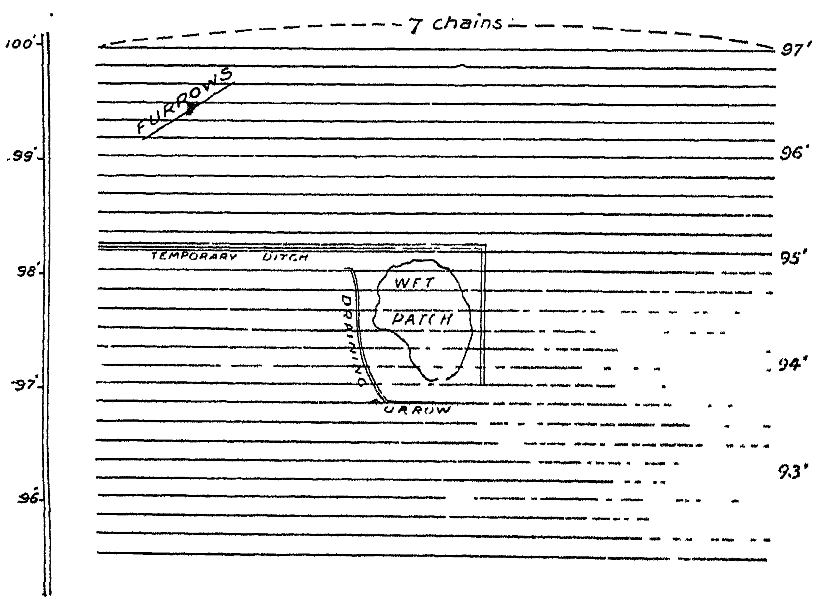


Fig. 19.

Where there is a patch of ground which, owing either to the steepness of its grade or to that "greasy" quality to be found in places where mallee and certain other trees have grown, will not absorb a sufficient quantity of water

if irrigated in the ordinary way, the number of furrows may be increased as shown in Fig. 20; and if there is a limestone patch which will take an excessive amount of water, the number of furrows may be diminished as in Fig. 21.

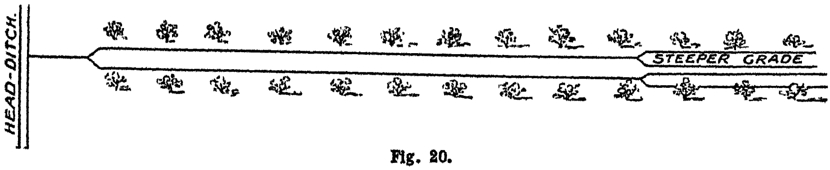


Fig. 20.

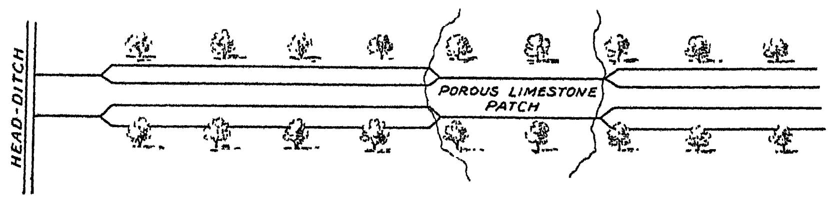


Fig. 21.

The more furrows there are the more the surface of the ground is exposed to the water, and the more quickly it will absorb it; and conversely the fewer furrows there are in a piece of land, the longer it will take to water it. Applying this simple fact will considerably aid in the even distribution of water.

Continuous Irrigation.

In the settlements on the Murray, where the water-supply is obtained by pumping, an irrigation once started proceeds from necessity day and night until it is finished. The disadvantages of irrigating at night are obvious, but where land has been well laid out for irrigation by the furrow system, and irrigators understand their business, the advantages outweigh them. Continuous irrigation is the more economical as regards both the quantity of water used, and labour in distributing it, but what concerns the settler still more is that, if he has a continuous stream of water on a block, he is much better able to judge when the land has had sufficient water and is saved a lot of trouble in the regulation of it. Difficult or badly laid out portions should be finished in daylight, but there should be no difficulty in the irrigation of blocks well laid-out on the furrow system at night-time if the head ditches are in good order, the stream regular, and the boxes properly set.

Irrigation of Lucerne.

The frequency with which lucerne should be irrigated depends altogether on the amount of sun heat available to it. In cool cloudy weather when it grows but slowly, lucerne does not use much water and an irrigation at intervals of from three to five weeks will be sufficient; but in the long hot days of midsummer it grows rapidly and uses up water very quickly, and

in some soils an irrigation every ten or twelve days will then be necessary to get the maximum results. Some growers advocate even more frequent irrigation, giving lucerne two light waterings to one cut; some irrigate just before cutting in order that fresh growth may not be delayed while hay is being made and carted; others prefer the delay to the inconvenience of making hay on wet ground.

Lucerne hardly grows at all above ground in the winter, and consequently requires little water at that time. Where lucerne is irrigated by flooding by means of check-banks, it is advisable, in most cases, to avoid night-watering if possible; a farmer who grows both fruit and lucerne (separately) may turn the water into his orchard or vineyard at night and irrigate his lucerne beds by day.* Where the modification of the furrow system described in Part III is used, there should be no difficulty in irrigating at night.

Irrigation of Vegetables.

Vegetables may be irrigated by the furrow system, applied, of course, on a smaller scale than in the case of fruit trees or vines, but they require more frequent water in smaller quantities. Some kinds, like pumpkins, melons, &c., are very easy to water, and may almost be said to look after themselves. Root vegetables like carrots and turnips are more trouble, but the hardest vegetable to grow in this way is the potato, which needs very careful watching because if the earth round the tubers lacks sufficient moisture even for a day or two they will inevitably start a fresh growth when they get the water, and a crop of diminutive and ill-formed tubers will be the result. Too much water will spoil potatoes by making them soapy and musty-flavoured.

The easiest and best way to irrigate vegetables is by spraying. That this may be possible on the average irrigation farm it will be necessary to have fairly large underground and overhead storage tanks connected by pipes and a small pump driven by a windmill or motor.

NOTES.

Cubic feet per minute multiplied by 375 = gallons per hour.

One cubic foot of water = $6\frac{1}{4}$ gallons (nearly).

One ton of water = 36 cubic feet = 225 gallons.

One gallon of water weighs 10 lb.

An acre-inch of water = 3,630 cubic feet.

(To be continued.)

* A correspondent has written to the Department saying that he has found that if he waters his lucerne in the day time on very hot days in summer the water lies on the surface, and, becoming very hot, scalds the lucerne plants. The cause of this would seem to be either (1) that the land in question is a stiff, impervious clay, in which case it can hardly be very suitable for lucerne growing; or (2) that too much water is used, so that a proportion of it lies on the surface after the soil has been thoroughly saturated.

Rate of Seeding Maize.

GRAFTON EXPERIMENT FARM, 1914–1915.

H. WENHOLZ, B.Sc. (Agr.), Assistant Plant Breeder.

The Experiments Supervision Committee, under whose control these experiments are being conducted, wish to draw the attention of farmers to the fact that final conclusions cannot yet be drawn from these trials, as they have only been conducted for one year. Later, when results for, say, five years are available, a summary will be prepared, as sufficient evidence should then be available to enable conclusions to be formed. Meanwhile it is felt that the public are entitled to know the results obtained each year.

Variety Leaming.

AN experiment to determine the most suitable rate of seeding for the variety of maize known as Leaming, was sown on 18th November, 1914, on clayey alluvial, medium fertile soil. The rows were six links apart (4 feet) and 694½ links long, and the different rates of seeding were as follow:—

No. of Plot.	Rows.	No. of Grains per Chain.	Approximate Average Distance between Grains.	Weight of Seed used per Plot.	Weight of Seeding per Acre.
			inches.	oz.	lb.
1 (*check*)	2–3	86	9	13¼	10
2	4–5	52	15	8	6
3	6–7	69	12	10½	7⅞
4 (*check*)	8–9	86	9	13¼	10
5	10–11	104	8	16	12
6	12–13	121	6½	18½	13⅞
7 (*check*)	14–15	86	9	13¼	10

As the germination was about 83 per cent. throughout the plots, the final stand was as follows:—

No. of Plot.	Rows.	Plants per Chain.	Approximate Average Distance between Plants.	Approximate No. of Plants per Acre.
			inches.	
1 (*check*)	2–3	69	11½	11,500
2	4–5	42	19	7,000
3	6–7	55	14½	9,167
4 (*check*)	8–9	69	11½	11,500
5	10–11	83	9½	13,833
6	12–13	97	8	16,167
7 (*check*)	14–15	69	11½	11,500

The experiment was cultivated on 12th December with a single horse tine cultivator, hilled on 23rd December with a disc hiller, and cultivated on 5th January with a Planet Jr. cultivator.

The plots were harvested on 22nd April, when the grain was fit to shell. The size of each plot was $\frac{1}{12}$ acre, and the yields were as follow:—

No. of Plot.	Rows.	Plants per Acre.	Yield of Plot.	Natural Yield.	Percentage Yield.	Computed Yield per Acre.
			lb.	lb.		
1 (*check*) ...	2–3	11,500	225	225	100	48·2
2 ...	4–5	7,000	168	220⅔	76·3	36·0
3 ...	6–7	9,167	182	215⅓	84·4	39·0
4 (*check*) ...	8–9	11,500	211	211	100	45·2
5 ...	10–11	13,833	260	221	117·6	55·7
6 ...	12–13	16,167	284	231	123·0	60·9
7 (*check*) ...	14–15	11,500	241	241	100	51·6

Season.—The rainfall during the growth of the crop was as follows:

November	158 points.
December	635 ,,
January	323 ,,
February	228 ,,
March	64 ,,
Total	14·08 inches.

Conclusions.—This experiment brings out the fact that, although the season was not of the best, owing to the dry spells occurring after the tasselling stage, a comparative high rate of seeding is suitable for this variety. It is not late maturing, and the ears do not go beyond a certain size, even on the best of land and in the best of seasons, so that it stands to reason that, to obtain the best results, it may be planted much thicker than the late maturing thick-stalked varieties, which are also grown in this district. It would be expected in a better season that the heaviest seeding would give more pronounced results, but that the close stand of over 16,000 plants to the acre was so satisfactory in the season just past is interesting indeed.

Liming an Orchard.

A correspondent recently asked whether, when using lime, it was better to use crushed limestone or burnt lime slacked. It was proposed to lime an orchard again this season, and he had previously used slacked lime, but had been strongly advised to try the crushed limestone.

In reply the Chemist to the Department stated:—

The kind of lime to be used depends upon the object for which it is employed. If it is required to break up and lighten heavy clay soil, freshly slacked stone-lime or powdered quicklime should be employed, as limestone has not the same mechanical action.

If it is required to sweeten sour soils or to supply lime to soils deficient in this ingredient, or on crops which are lime-lovers, then a dressing of ground limestone or so-called "agricultural" or "mild" lime is sufficient.

If the latter is used apply about 1 ton to the acre. In the case of quicklime or freshly-slacked lime, about ½-ton per acre is sufficient.

The Banana.

W. J. ALLEN.

SOME two to three hundred thousand bunches of bananas are imported into this State annually, principally from Queensland and Fiji. When one considers the average high price which this fruit realises one naturally asks why is New South Wales not taking a more active part in the culture of this fruit in order to satisfy the large and increasing demand. From Coff's Harbour northward to the Tweed we have conditions of soil and climate particularly suitable to this class of fruit, and payable plantations have been made in recent years as far south as Gosford, so that there appears to be no reason why such a very large part of our requirements should have to come from outside our own borders.

Soil.

The essential features of a first-class banana soil are an abundant moisture supply and good drainage. The soil best suited for the cultivation of the plant is a warm, deep loam with a good proportion of humus.

On the Tweed River, the deep, well-drained volcanic scrub land—forming virgin soils rich in humus—is giving the best results. Old cane land (originally rich scrub country), which has been allowed to run to lantana for some years after cane-growing has been given up, is being successfully used for banana-growing. The returns from these plantations are not so good as from those on the virgin scrub country, and probably they will not remain remunerative for so long a period. There are instances of plantations failing to make headway and to crop satisfactorily when planting has taken place on worn-out cane land that has not first been allowed to recuperate for some years under lantana or some other heavy growth.

New forest country is also being used for banana-growing on the Tweed, but it is too early yet to say how long these plantations will last. Most of the country devoted to banana-growing on the Tweed has a very rocky surface. The rocks vary in size from huge boulders down to that of ordinary road metal. In some cases the rocks are closely packed, in others they are scattered, but provided there is deep suitable soil below, the bananas flourish, notwithstanding the apparently adverse conditions. Floating rocks and boulders are found in varying quantities and depths beneath the surface in some places, but even under these circumstances there is generally ample soil.

The banana is a surface feeder, and there is little doubt that the deficiency in plant food in worn-out cane land could be satisfactorily supplied by use of fertilisers, but the restoration of humus to a great deal of this country is a more difficult proposition. Not only is lantana now a proclaimed weed, but land is useless while covered with it, and on the Tweed values are becoming too high to permit of areas being kept idle for a number of years. In a few places,

where the plough can be used, crops might be grown for feeding off to dairy cattle and the residue ploughed in, or a rank-growing grass, such as paspalum, might be sown; but such land is the exception, and for rocky, unploughable country a crop is required that will make some return, supply humus to the soil, and yet be easily eradicated when finished with. Possibly cowpeas would serve the purpose.

Drainage.

The necessity for good drainage is very clearly shown in one of the best plantations on the Tweed. This plantation is on newly-cleared scrub land, about two years from planting, and is giving an abundant yield. In one place a retentive clay crops out near the surface, forming a soak on the side of the hill. The banana plants surrounding this soak for some distance are all failing.

Aspect.

Even as far north as the Tweed, winter frosts occur on the lower levels, which are fatal to the banana. Care must be taken, therefore, to plant only on the higher parts of the slopes above the frost-line. The northern and eastern aspects are universally admitted to be the best suited for a plantation. Such aspects escape the most damaging winds, viz., those from the south and west. Land with either of these aspects also has the sun on it for a longer period during the day; consequently, such a plantation does not fall off in production during the winter in the same degree as one on a southerly slope. Obviously this has a marked effect on the returns, as generally speaking high prices rule during the winter.

Clearing.

It is always preferable to clear the land of timber before planting. In some cases growers only partially clear their holdings, but it is a doubtful economy, and can only be regarded as justifiable when capital is lacking. A properly cleared field means less expense in cultivation, better and more thorough working of the ground, and greater facility in handling the crop.

As a preparation, the soil should be thoroughly broken up to a depth of at least 12 inches. Care should be taken to remove all roots or decaying wood, as these are liable to convey fungus diseases to the young plants. Thorough, deep ploughing, followed by a good harrowing, will assist the plants to root deeply and largely reduce the danger of their being blown over.

On the Northern Rivers the scrub is felled, and fired when fit. If the burn is good, very little more work is done before planting. To grub the scrub land is, of course, out of the question, and generally the planter is anxious to get his plantation going without delay. But, putting aside the question of delay, if the country were sown with paspalum for dairying whilst the stumps rotted out, it would be almost impossible to get rid of the grass later in places where it was too rocky to plough. On the other hand, if not sown it would be a constant expense in brushing, so planting direct after the burn seems the only practical way. However, here and there in a plantation, patches will be seen where plants are dying out, and most often these are near the remains of huge rotting stumps.

Fig. 1.—Fiji Bananas growing at Adamstown

THE BANANA.

Fig. 2.—Showing damage done by wind to plants when planted in exposed positions.

THE BANANA.

Preparation of Soil.

Where the rocks are thick any preparation of the soil beyond removing some of the rocks, where the hole is to be made to receive the plant, is impracticable. The same applies to newly-burnt scrub country, on account of stump roots. In some places the land is naturally free enough of rocks to allow of ploughing, or the rocks have been cleared from the surface. It is, however, the exception to see land prepared by ploughing, or broken up in any way beyond the digging of small holes for the reception of the plants.

Planting.

The laying out of the field may be carried out in a similar way to that adopted when marking out lines for an orchard. The suckers of the Cavendish banana should be planted not less than 12 to 16 feet apart, according to the soil. Other varieties—such as Sugar and Lady's Finger—should be at least 16 to 18 feet apart. When planted, the earth around the sucker should be firmly pressed down with the feet, so as to prevent drying out of the soil. The size of the hole which it will be necessary to dig will depend upon the preparation which the soil has already received. The top of the corm, however, should not be more than a few inches below the surface.

Bananas are planted at all seasons of the year. October is considered the best month in this State, as the growth is much more rapid with early spring plantings than with later ones.

Selection of Plants and Propagation.

Three kinds of plants are used for propagation—(1) the old stumps that have produced fruit; (2) large offsets or suckers, from six to eight months old, with well-developed bases or corms; (3) small offsets, from a few weeks to two or three months old and from 8 to 30 inches high. The best kind, and that most generally used, is the large offset or sucker. This is generally removed from the stem by means of a sharp spade, the earth being first of all carefully drawn aside so as to expose the junction of the offshoot with the parent. It is essential with such plants that they be cut back within about 6 inches of the corm. These larger plants are further prepared by the removal of all the old roots. Small and very young offsets are not selected as a rule, on account of being too weak and delicate.

The general practice on the Tweed, however, is not to cut back the plant so hard; they top just below the tuft of leaves. The original plant then sprouts out from the top and bears the first bunch, the first sucker from it giving the second bunch.

Time for allowing an Offset to Grow.

Growers can generally time their crops to meet the market demands. This is done by selecting the right time to allow new plants to start. It is, however, best not to remove the suckers when they first appear, but to wait until they are a few inches high; if this is not done, fresh buds may start into growth.

Removal of Suckers.

The number of offsets which should be allowed to grow will depend upon the fertility of the soil, the moisture available, cultivation, &c. In a favourable locality it is not unusual to allow two or even three suckers to start when a corm is planted, but, unless the conditions are very favourable it would be better to leave no more than one sucker at the beginning, and to allow another to start several months later. The first will join the main plant, and the second will be known as the first sucker. Still another sucker-- a second on the opposite side of the plant—may be allowed to grow before the first bunch of fruit is produced. How often the plant may be allowed to support a new offset will be determined by the conditions under which

Fig. 3.—Showing general growth.

Fig. 4.—A bunch of plantains.

BANANA-GROWING ON MR. RICKETT'S PROPERTY, KINCUMBER.

it is growing. It should also be borne in mind that when a plantation is on very rich soil the young plants send up too many suckers at the same time; the result is, that if they are all allowed to remain, the young clump will have four or five suckers, each producing bunches almost at the same time, and providing so much shade that no good young suckers are produced until the old stools are cut down when the fruit is gathered. Another disadvantage is the number of bunches that the parent root has to mature at the same time. It should be the aim of the growers to keep up a continuous supply of fruit, and not to permit more than three to five stems to be formed at the same time, even on the more mature ratoons.

Cultivation.

The size of the future plant is no doubt influenced by the sucker chosen, and its vigour. The vigour of the plant can only be maintained by thorough cultivation and attention. Weeds must be kept in check, and the ground should be regularly stirred. The importance of frequent cleansing of the ground must not be underestimated.

In the rocky and newly-burnt country only hand cultivation can be carried out, and it requires a deal of experience to do thorough work amongst the rocks, and not ruin an endless number of hoes. Dead leaves, &c., from the plants gather in the clumps, and at least once a year these should be cleared out, or they will check young suckers coming up by smothering them.

Fig 5.—View of part of Upper Plantation, Messrs. Bailey Bros., Adamstown

Fertilisers.

In all banana-growing countries the crop is looked on as very exhausting; one authority has stated that no other cultivated plant exhausts the soil to such an extent. The land should therefore either be very heavily manured or have a complete rest, during which its fertility may be restored.

Extensive experiments in manuring bananas have been carried out in Queensland by the Department of Agriculture there. These were fully described in the *Queensland Agricultural Journal* for August, 1914. The proportions used in the basic formula were 40 lb. nitrogen, 80 lb. phosphoric acid, and 80 lb. potash per acre.

The experience gained in Queensland, where a million bunches are produced annually, should be applicable to the banana lands in our own State, as the soil and climatic conditions are in many ways very similar.

Mr. F. B. Guthrie, Chemist of our own Department, has supplied the following formulæ which gives these proportions as nearly as possible:—

$4\frac{1}{4}$ cwt. Superphosphate		per acre.
$1\frac{1}{2}$,, Sulphate of potash		
3 ,, Dried blood (or) 2 cwt. Sulphate of Ammonia		

Different quantities of these proportions might be tried:

$6\frac{1}{4}$ cwt. Superphosphate	per acre.
$2\frac{1}{4}$,, Sulphate of potash	
$4\frac{1}{2}$ cwt. Dried blood	
or	
$8\frac{1}{2}$ cwt. Superphosphate	per acre.
3 ,, Sulphate of potash	
6 ,, Dried blood	

These formulæ will all be affected during the currency of the war by the failure of supplies of sulphate of potash, and it will be necessary to apply the potash separately. Make up the mixture as to the other items, but apply the potash in the form of wood-ashes two or three weeks previously Roughly 13 or 14 cwt. of wood-ashes will be required for each 1 cwt. of sulphate of potash.

Varieties.

There are many varieties of bananas under cultivation, but those principally grown for shipping are the Cavendish, Gros Michael, Red Spanish, and Jamaica. The Cavendish is grown very extensively on the Tweed River for market purposes. Gros Michael has been tried to a limited extent there, but its crops have not warranted extended planting. Neither Ladies' Fingers or Sugar bananas have proved profitable market varieties. In the Gosford and Newcastle districts the Plantain variety is the one that up to the present has been planted most extensively, and is proving satisfactory. Plantings of Cavendish are now being made, but it is early to say whether it will prove as profitable as Plantain.

Crops.

With proper care and attention the first crop should be harvested from fifteen to eighteen months from the time of planting. On old cane land it would probably be nearly two years before a crop could be harvested. The bunch is cut with a portion of the stem ($1\frac{1}{2}$ to 2 feet), for convenience in handling. If the terminal flower buds have not been cut off they should be removed now, though it is better to do this as soon as the fruit has ceased to set. The cut should be made within a few inches of the last banana. The correct time for picking the fruit varies, and it is only by experience that the exact stage of maturity which is best under the circumstances can be known. Where the market is handy the fruit can be allowed to become "full," and can, as a rule, be picked a week to ten days before it is ripe. When shipping long distances the bunch is cut much earlier than is the case

Fig. 6 A plantation which has been made only seven or eight months, and has been kept clear of weeds by hand hoes. Stones not removed from surface

Fig. 7.—Plantation made the same time as that shown in Fig 6, on the same class of country and adjoining it. The stones, however, have been removed, and the soil is cultivated with horse hoes. Taken on the whole the plants have not made such good growth as where the rocks remain.

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Fig. 8.—Showing poor growth of plants through weeds not being kept down. This plantation was made three years ago, and until just recently had not been kept clean. Compare growth with those planted seven or eight months, but kept free from weeds.

Fig. 9.—Young plantation, planted November, 1914, on newly-burnt scrub country. This shows the very rocky nature of the country, also the stumps left standing. Notwithstanding this, the growth has been remarkable.

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when the market is near by. However, it is usually admitted that it is best to allow the fruit to get as full as is safe, considering the time necessary to place it upon the retail market.

The profits in banana-growing go to the man who forwards fine fruit, and one of the first things to learn in marketing is care in handling the produce. Freight is a considerable item in connection with this crop, and the charges are the same for a large bunch as for an inferior one. Not only so, but large fruit sells more readily, and at a higher price per lb. than small fruit. A full grown bunch may contain from three to sixteen "hands," and a hand from ten to twenty fruit. In the West Indies buyers consider nine hands a bunch, eight hands counting for three-quarters of a bunch, and seven hands for only half a bunch on the price paid. Bunches on our Northern rivers run about twelve dozen each when grown on suitable soil and in favourable positions, and given proper attention; and in the Gosford district the Plantains average about six dozen to the bunch.

The following figures, for which I am much indebted to one of the growers on the North Coast, will give some idea of the cost of planting and maintenance:—

Two and a quarter acres lantana land, partly planted in October and November, 1910, and remainder planted in May and June, 1911 (including the clearing of lantana), cost up to, August, 1913, £70.

Seven and a half acres old cane land, planted December, 1911, cost to December, 1914, £255.

Two and a half acres scrub land, planted November and December, 1913, cost to February, 1915, when it was just coming into crop, £81.

RETURNS from 12 acres of Bananas for the year 1914:—

	£	s.	d.	£	s.	d.
1,794 cases, less marketing expenses at Sydney, returned				722	4	1
Less wages (not including growers' own time) ...	222	0	0			
Local river freight	24	10	0			
Cartage and rail to Byron Bay	35	5	4			
Cases	73	13	0			
Sundries	4	5	11			
				359	14	3
Nett return				£362	9	10

The following figures give the number of cases marketed each month for one year, and will show how the production drops during the winter months. The figures refer to a plantation on the Tweed River with a southerly aspect, and the difference would be less from a plantation with a northerly or easterly aspect; figures with regard to the latter were not obtainable:—

January	290 cases.	July	61 cases.
February	289 ,,	August	123 ,,
March	194 ,,	September ...	78 ,,
April	179 ,,	October	84 ,,
May	91 ,,	November ...	144 ,,
June	96 ,,	December... ...	244 ,,

Like all producers of perishable goods, when production is increasing quickly, the banana grower feels anxious about over production. To overcome this danger, better distribution may be necessary. Our Southern and Western towns would consume large quantities, but before this can be done arrangements will have to be made so that the fruit can reach them more directly than is the case at present, so that the expense incurred between the time the fruit leaves the plantation and the time it reaches the country consumer may be considerably lessened. The North Coast line will, no doubt, improve matters, but better communication, direct from the coast to our western and southern towns, is really what is required.

THE QUEENSLAND PRICKLY-PEAR EXPERIMENTS.

IN the Annual Report of the Dulacca Prickly-Pear Experimental Station for the year ending 30th April, 1915, Dr. Jean White-Haney, Officer-in-Charge, gives an interesting account of the work done to date.

The chief methods of application adopted at this station are:—

(*a*) Injection of a solid specific into the second segment from the top of branch.
(*b*) Injection of a liquid specific or solution of specific into the second segment from the top of a branch.
(*c*) Spraying of a specific or a solution of specific over the aerial part of the plant by means of an ordinary spray pump.
(*d*) Spraying of a specific or a solution of specific over the aerial part of the plant by means of an atomiser pump.
(*e*) The evolution of gas or vapour charges over the aerial parts of the plant.

In connection with these, the report states:—

> These methods of application are all important, and all—with, probably, the exception of the atomiser spray—necessary in the colossal task of getting rid of the prickly-pear from this State.
>
> The surest method for obtaining good results is the injection method of application. Another important advantage of this method over all the others is that it appears to be the most inexpensive.
>
> Practically no poison is wasted, and, as in the process of injection some of the conducting pear segments are necessarily severed, there is obviously nothing to hinder the direct entrance of the poison into them.
>
> The value of this mode of pear clearance is, however, limited, as it can only conveniently be employed in those localities in which the pear is distributed as scattered plants.
>
> Spraying is the most convenient way of dealing with scattered clumps of pear. The effects produced on the plants after such treatment are far more variable than they are when the injection method is adopted. . . . . . . The evolution of poisonous vapours amongst the plants promises to be the best method to adopt when dealing with dense, impenetrable pear. The ultimate success of this mode of treatment is, apparently, to a large extent dependent on the direction and force of the wind. Like the last-mentioned treatment, it is more influenced by climatic conditions than is the injection method.

The results furnished by the poisoning experiments carried on at the Experimental Station up to the present date have led to the following provisional conclusions:—

1. The most effective specific yet applied to the plants in the form of solid injections, liquid injections, or spray, is arsenic acid (arsenic pentoxide).
2. The most effective gas treatment is produced by the fumes of arsenic trichloride.
3. The best season for the application of poisoning by any of the previously-mentioned methods is during the summer or early autumn.
4. The success of the undertaking is largely dependent on the rainfall prior to and after poisoning, probably more especially on the former.

The Judging of Dairy Stock on Points for Production, Constitution, and Type.

BANGALOW AGRICULTURAL SOCIETY, MARCH, 1915.

L. T. MACINNES, Dairy Instructor.

FOR some considerable time past in dairying countries much thought has been given to the devising of some scheme whereby in judging dairy stock in the show-ring a truer idea of their worth could be arrived at. It was recognised that many animals, male and female, were awarded blue ribands on their appearance, but when it came to demonstrating practically what they or their offspring could do in the matter of yielding milk and butter-fat, the results failed to confirm the show-ring award. The spread of the herd-testing movement during recent years in the Tweed and Richmond River districts served to crystallize what were doubts into absolute convictions. Dairymen became alive to the fact that they wanted more than constitution, type and appearance; valuable though these were there must go with them the powers of producing in large quantities milk rich in butter-fat, and further, of being able to transmit these high dairy qualities to their offspring.

As a result of the educational efforts made by the Dairy Branch of the Department of Agriculture, the Bangalow Agricultural and Industrial Society decided to take up the matter and endeavour to bring about a change in the usual methods adopted in judging dairy stock at agricultural shows. They were in a most favourable position as regards carrying any such reform to a successful issue. Bangalow justly prides itself on being the pivot of the richest and largest dairying district in New South Wales.

Its annual show of dairy stock compares favourably with similar exhibitions held in the various States of the Commonwealth. But in addition to these advantages this Agricultural Society occupies the unique position of being situated in the centre of a network of herd-testing associations, which annually record the yields in milk and butter of about 20,000 cows. Also many of the surrounding herds of pure-bred cows are being tested by Government officials under the United Pure-bred Dairy Cattle Breeders' Testing Scheme.

Thus, probably, no other similar body could compare with the Bangalow Society in affording facilities for successfully inaugurating such a reformation.

In formulating a scheme the responsibility of launching such a new departure was recognised, and it was decided to appoint a sub-committee to confer with delegates from the Tweed-Richmond Herd-testing Council, and the breeders of pure-bred dairy stock of the surrounding districts. The assistance of the district officer of the Dairy Branch, Department of Agriculture, was also availed of. This conference met in Bangalow on the 23rd July, 1914, and drew up a comprehensive report endorsing a detailed scheme submitted by the writer for the perusal and approval of the Committee. The following letter to the President of the A. and I. Society explains the limitations and ideals which governed the conference's deliberations :—

The President, Bangalow A. and I. Society.

Dear Sir,—In submitting the accompanying Report for your Committee's perusal and approval we desire to point out that the extent of our recommendations has been limited by the shortness of the period from which acceptable records of the yields of dairy cows can be obtained, on account of systematic and official testing for the butter-fat production of each individual milker being so recently established in our midst.

Time alone can remedy this, and such being the case, we recommend that, as years go by, our initial scheme, if endorsed by your committee, has its scope enlarged to take in the additional records hereinafter enumerated.

We recognise that these proposals are in no way perfect, and that, as with all Show Schedules in the past, they are capable of being much improved upon as experience points out their shortcomings.

In formulating this scheme we kept in mind, as the primary need, the bringing about of such a reform in our present system of Show Judging as will make for a definite, though necessarily small, beginning towards achieving the end in view, viz., the breeding up of a better class of Dairy Stock, and making the Agricultural Society more effective as an educational centre.

This Conference unanimously desires to have placed on record the services rendered the dairying industry in this matter by the Department of Agriculture.

J. T. YOUNG, Chairman.
July, 1914. W. H. READING, Secretary.

Main Features of the Scheme.

The main features of this scheme, as adopted by the committee on the 5th August, 1914, were :—

1. A separate sub-section to be included in the Schedule for the 1915 Show for dairy stock to be judged on a scale of points for production, type, constitution, and appearance.

2. Entries to be made under two headings.

   (*a*) For cows tested under the United Pure-bred Dairy Cattle Breeders' Association's Scheme.

   (*b*) For cows tested in the various herd-testing associations affiliated with the Tweed-Richmond Herd-testing Council.

3. The relative values of production, constitution, and type. It was decided that this ratio should be 4 : 3 : 3—*i.e.*, for every 4 points allowed for production there should be 3 for constitution and 3 for type.

4. The relative values of production from :—

   (*a*) Cows over 6 teeth.

   (*b*) Cows with 6 teeth and over 4 teeth.

   (*c*) Heifers with 4 teeth and under.

This was fixed as follows :—

(*a*) For each 100 lb. of butter given by a cow with over 6 teeth, 12 points.

(*b*) For each 100 lb. of butter given by a cow with 6 teeth and over 4 teeth, 15 points.

(*c*) For each 100 lb. of butter given by a heifer with 4 teeth and under, 20 points.

5. In the Trio Class, three generations—grand dam, dam, and daughter—to

(*a*) Allow additional points for progressive breeding (where increased production in each succeeding generation is shown).

(*b.*) Deduct points for retrogressiveness (where a decrease in production is shown, taking the grand dam as a base).

It was decided to allow, in this class, 1 point for every 5 lb. of butter of increase or decrease as the case may be, taking the grand dam as a base.

6. All records to cover a period of 273 days in the Pure-bred Cattle Breeders' Association's Class, and 360 days in the case of the Herd-testing Associations.

7. To give prizes as follows :—

TO BE JUDGED BY PRODUCTION AND POINTS.

Production results to be provided from records of the Pure-bred Cattle Breeders Association by 9th March, 1915.

Points for constitution and type to be awarded first day of Show.

	Prizes. 1st.	Prizes. 2nd.
Class—	**£**	**£**
Bull, six teeth and over, to produce records from three daughters ...	**2**	**1**
Cow, more than six teeth, to produce own record	**2**	**1**
Cow, six teeth and under, to produce own record	**2**	**1**
Trio—Grand dam, dam, and daughter to produce own records ..	**2**	**1**
Production results to be provided by Tweed-Richmond Herd-testing Council by 9th March.		
Bull, six teeth and over, to produce records from three daughters ...	**2**	**1**
Cow, more than six teeth, own record	**2**	**1**
Cow, six teeth and under, own record	**2**	**1**
Trio—Grand dam, dam, and daughter—to produce own records ...	**2**	**1**

8. A maximum of production was fixed as follows :—

Cows over six teeth	500 lb.	butter.
Cows with six teeth and over four ...	400	„
Heifers with four teeth and under ...	300	„

any exhibits showing higher yields only to score points on the maximum allowed.

9. To govern these contests, the following rules were adopted :—

1. Judge to allot points for constitution, general appearance, and type on the show-ground, unaware of the points scored for production.

2. Production records to be supplied the secretary two weeks before the show date. Such records to be obtained from some recognised body such as a herd-testing association or the Pure-bred Dairy Cattle Breeders' Association.

3. Points for production records to be worked out by the secretary.
4. Secretary, on receiving the judge's points for constitution, &c., to add on those for production and the awards then allotted.
5. Score cards to be filled up in triplicate—one for the exhibitor, one for the secretary, and one to be affixed to the pen in a prominent place for the information of the public.

Entries.

In all, twenty-seven entries were received. Of these, eight were in the classes provided for members of the Pure-bred Dairy Cattle Breeders' Association, and nineteen from members of the various district herd-testing associations. As this is the first time contests on these lines have been held on an Australian show-ground such a response on the part of breeders must be considered extremely satisfactory. It demonstrates that show exhibitors are alive to the possibilities of the testing movement.

Details of the Judging.

SUB-SECTION A.—Judge: Mr. J. A. Alcorn, Alstonville, New South Wales.

Production results obtained from records compiled by the United Pure-bred Dairy Cattle Breeders' Association:—

Class.—*Bull, six teeth and over, to produce records from three daughters.*

No entries. Two Jersey bulls, which otherwise would have been entered, had developed lameness, and could not be travelled to the Show ground.

Class.—*Cow, more than six teeth, to produce own record.*

Six Entries.

Owner.	Breed.	Name.	Points scored.	Award.
F. G. Flower	Jersey ...	Acrasia	132·12	First.
A. E. Brown	,, ...	Baroness of Ingleside ...	128·26	Second.
A. E. Brown	,, ...	Nancy	118·92	Third.

Acrasia's Score Card.

	Points. Maximum allowed.	Scored.
Production	60	48·12
Constitution	45	40·00
Type	45	44·00
Total	150	132·12

Production (12 points allowed for each 100 lb. of butter), 401 lb. in 273 days.

General Remarks.—Lactation period, December, 1912, to August, 1913.

Age at time test was taken, 6 years.

Date of calving prior to test commencing, 18th November, 1912.

Date of calving subsequent to completion of test, 21st October, 1913.

Breed.—Jersey, No. 807, A.J.H.B.

During testing period fed on chaffed cow-cane and bran from June to August (winter months), balance of period grazing in open paspalum pastures.

Rugged at night from June to September.

Baroness Ingleside—Score Card.

	Points. Maximum allowed.	Scored.
Production	60	46·26
Constitution	45	44·00
Type	45	38·00
Total	150	128·26

Production.—385·49 lb. butter in 273 days.

General Remarks.—Lactation period, April, 1913, to December, 1913.

Age at time test was taken, 6 years.

Date of calving prior to test commencing, 9th March, 1913.

Date of calving subsequent to completion of test, 18th March, 1914.

Breed.—Jersey, No. 2990, A.J.H.B., vol. 4.

During testing period fed on bran and chaff in winter months, balance of period in open paspalum pastures.

Rugged at night from June to September.

Class—*Cow, six teeth and under, to produce own record.*

Two Entries.

Owner.	Breed.	Name.	Points scored.	Award.
F. G. Flower	Jersey ...	Princess Enid	129·67	First.
A. E. Brown	,, ...	Thelma's Bessie 2nd of Ingleside.	122·55	Second.

Princess Enid's Score Card.

	Points. Maximum allowed.	Scored.
Production	60	47·67
Constitution	45	42·00
Type	45	40·00
Total	150	129·67

Production (15 points allowed for each 100 lb. of butter), 317·82 lb. butter in 273 days.

General Remarks.—Lactation period, April, 1914–December, 1914.

Born 24th October, 1911.

Date of calving prior to test commencing, 28th March, 1914.

Date of calving subsequent to completion of test, 20th June, 1915.

Breed.—Jersey, No. 3514, A.J.H.B.

During testing period fed on open paspalum pastures, except for last two months, when a ration of sweet potatoes was added.

Rugged at night from June to September.

Thelma's Bessie 2nd of Ingleside—Score Card.

	Points. Maximum allowed.	Scored.
Production	60	32·66
Constitution	45	45·00 (maximum)
Type	45	45·00 (maximum)
Total	150	122·66

Production (15 points allowed for each 100 lb. butter), 217·77 lb. butter in 273 days.

General Remarks.—Lactation period, March, 1914–November, 1914.

Born 17th June, 1911.

Date of calving prior to commencing test, 8th March, 1914.

Date of calving subsequent to completion of test, 8th March, 1915.

Breed.—Jersey, No. 3029, A.J.H.B., vol. 4.

During period of test fed on open paspalum pastures.

Rugged at night from June to September.

This cow scored full points for constitution and type, but was beaten for first place on account of lower production.

SUB-SECTION B.—Judge: Mr. Dixon Cooke, Alstonville, N.S.W.

Production results obtained from records compiled by the Tweed-Richmond Herd-testing Council :—

Class.—*Bull, six teeth and over, to produce the records of three daughters.*

Four Entries.

Owner.	Breed.	Name of Bull	Points scored.	Award.
J. T. Young ...	Illawarra Milking Shorthorn.	Reform ...	419·13	First.
W. H. Dudgeon...	„ „ „	Captain ..	394·24	Second.
James Bros. ..	„ „ „	Gay Lad	362·82	Third.

Reform's Score Card.

	Points. Maximum allowed.	Scored.
Production	180	169·13
Constitution	135	130·00
Type	135	120·00
Total	450	419·13

Production of daughters—360 days.

Name.	Age.	lb Butter.	Points.
Mermaid, No. 33 ...	Over six teeth (5 years)	592	60 (max.)
Star, No. 25	„ „ „ (3½ „)	460·2	55·22
Emerald, No. 63 ...	Under „ „ (2¾ „)	359·4	53·91
	Total (as above)	1,411·6	169·13

General Remarks.—Born 1905.

Breed—Illawarra Milking Shorthorn.

Breeder—Hugh Dudgeon, Jamberoo.

Lactation periods of three daughters, whose records were submitted, were for the twelve months ending 28th February, 1915.

Mermaid.—This cow was also second in the class for cows with more than six teeth, and full particulars about her are given under that heading.

Star.—This cow also scored first place in the class for cows with six teeth and under. Full particulars about her are there given.

Emerald.—Date of calving prior to test commencing, 13th January, 1914.

Date of calving during the period of test, 27th January, 1915.

Bred by owner.

Breed—Illawarra Milking Shorthorn.

Fed on oats, Italian rye, and rye corn, mixed with vetches, in addition to paspalum-clover pasture.

Rugged at night during winter months. All feed used grown on the farm.

In addition to the abovementioned offspring this fine bull has three other daughters testing in the District Association who would be worthy to win a place for him in this class in any of our show competitions.

For a similar period their respective productions were:—

No. 6 ...	... Pride ...	... 428·4 lb. butter.
" 22 ...	... Fussy ...	... 468·0 "
" 55 ...	... Kitty ...	... 435·9 "

This makes an aggregate of 2,744 lb. of butter produced in one year by six daughters of this bull—or an average of 457·3 lb. each—a fine record.

The last named, "Kitty," is further mentioned as amongst the winners in the Trio class.

Reform's Pedigree.—By Gentle's Prince, out of Jenny; Gentle's Prince is by Red Prince, out of Gentle; Jenny is by Mr. H. Dudgeon's bull Charmer.

Captain's Score Card.

	Points. Maximum allowed.	Scored.
Production	180	159·24
Constitution	135	120
Type	135	115
Total	450	394·24

Production of Daughters.

Name.	Age.	lb. Butter.	Points.
Josephine	6 teeth and over	444·5	53·34
Bluey	Under 6 teeth	308·4	46·26
Flower	4 teeth	298·2	59·64
	Total as above	1,051·1	159·24

General Remarks.—Born 21st September, 1907, by Vain Captain (imp.), out of Daisy II, No. 137, Vol. 1, M.S.H.B. of N.S.W.

Breed—Milking Shorthorn, M.S.H.B., No. 156, Vol. 3.

Breeder—W. H. Dudgeon, Bangalow.

Lactation periods for the three daughters, whose records were submitted, were for the twelve months ending 28th February, 1915.

Josephine.—Calved 13th February, 1914. During winter fed on sweet potatoes; balance of period on grass alone.

Bluey.—Calved 4th September, 1913, and again on 25th October, 1914. During winter fed on sweet potatoes; balance of period on grass.

Flower.—Calved 23rd August, 1913; lost a calf in June, 1914; grass fed throughout.

All rugged at night during the winter months.

All feed grown on the farm.

Gay Lad's Score Card.

	Points. Maximum allowed.	Scored.
Production	180	128·82
Constitution	135	120·00
Type	135	114·00
Total	450	362·82

Production of Daughters—360 days.

Name.	Age.	lb. Butter.	Points.
Janey, No. 53...	6 teeth and over	349·1	41·89
Empress, No. 27	,, ,, ...	322·1	38·65
Model	Under 6 teeth	321·9	48·28
	Total	993·1	128·82

General Remarks.—Red bull, born November, 1907. Sire, Roan Prince; sire of sire, Red Prince; dam Graceful, No. 276, M.S.H.B. of N.S.W., Vol. 1.

Bred by Walter Vidler, of Rous, Richmond River, N.S.W.

NOTE.—All three of the winning bulls in this class are stated to trace their lineage back to Major (imp.).

Class.—*Cow, more than* 6 *teeth, to produce own record.*

Seven entries.

Owner.	Breed.	Name or Number.	Points scored.	Award.
J. T. Young ..	Illawarra Milking Shorthorn	Empress, No. 42	148	First.
,,	,, ,,	Mermaid, No. 33	141	Second.

Empress' Score Card.

	Points. Maximum allowed.	Scored.
Production	60	60 (maximum.)
Constitution	45	45 (maximum.)
Type	45	43
Total	150	148

Production.—720 lb. of butter.

General Remarks.—Lactation period, May, 1914—28 February, 1915; dates of calving prior to test commencing, 9 May, 1913; 7 April, 1914 (twins); date of calving subsequent to completion of test, 6 July, 1915.

Bred by owner.

Breed.—Illawarra Milking Shorthorn.

During the winter, fed on sliced sweet potatoes and in addition green fodder crops, such as oats and Italian rye and rye corn, with vetches mixed, in addition to clover and paspalum pastures. All feed used was grown on the farm.

Rugged at night during the winter.

The monthly yields were as follow:—

		lb. Milk.	lb. Butter.	Period.
May	1914	2,010	99	30 days.
June	„	1,890	79·2	30 „
July	„	1,800	86·4	30 „
August	„	1,710	92·1	30 „
September	„	1,650	84·9	30 „
October	„	1,365	66·9	30 „
November	„	1,245	59·7	30 „
December	„	1,185	58·2	30 „
January	1915	1,110	53·4	30 „
February	„	795	40·2	30 „
Total		14,760	720	300 days.

For a period of 273 days to 3rd February, 1914, the yield was 14,044 lb. of milk, 683·8 lb. of butter. To make this yield more meritorious it must be noted that it was given subsequent to giving birth to twin calves, and whilst carrying another calf.

Mermaid's Score Card.

	Points. Maximum allowed.	Scored.
Production	60	60 (maximum.)
Constitution	45	41
Type	45	40
Total ...	150	141

Production.—592 lb. butter (360 days).

General Remarks.—Lactation period, 12 months ending 28th February, 1915; date of calving prior to test commencing, 16th January, 1914; date of calving during period of test, 8th February, 1915. Bred by owner.

Breed.—Illawarra Milking Shorthorn. Age, 6 years.

Fed on oats and Italian rye and rye corn mixed with vetches, in addition to paspalum-clover pasture. All feed used grown on the farm.

Rugged at night through winter months.

Class.—*Cow, 6 teeth and under, to produce own record.*

Five Entries.

Owner.	Breed.	Name or Number.	Points scored.	Award.
J. T. Young	Illawarra Milking Shorthorn.	Star, No. 25 ...	138·00	First.
W. H. Dudgeon	Illawarra Milking Shorthorn.	Boxer	128·59	Second.

Star's Score Card.

	Points. Maximum allowed.	Scored.
Production	60	60 (maximum.)
Constitution	45	45 (maximum.)
Type	45	33
Total	150	138

Production.—460·2 lb. butter (360 days.)

General Remarks.—Lactation period, 12 months ending 28th February, 1915; date of calving prior to test commencing, 17th February, 1914; date of calving during period of test, 3rd February, 1915. Bred by owner.

Breed.—Illawarra Milking Shorthorn. Born in 1911.

Fed similarly to Mermaid. All feed grown on farm.

Rugged at night during winter.

Boxer's Score Card.

	Points. Maximum allowed.	Scored.
Production	60	53·59
Constitution	45	35 00
Type	45	40·00
Total	150	128·59

Production.—357·3 lb. butter (360 days.)

General Remarks.—Lactation period, 12 months ending 28th February, 1915; date of calving prior to commencing test, 30th August, 1913; date of calving during test, September, 1914. Bred by owner.

Breed.—Illawarra Milking Shorthorn. Fed on paspalum pasture alone.

Born November, 1911. Rugged at night during winter months.

Class.—*Trio—Grand dam, Dam, and Daughter—each to show own production records.*

Three Entries.

Owner.	Breed.	Names or Numbers.	Points Scored.	Award.
J. T. Young.. ...	Illawarra Milking Shorthorn.	G. D., Stately, No. 38 Dam, Kitty, No. 55 ... Daughter, Favourite, No. 66.	422·46	First.

Details of Score Card.

	Points. Maximum allowed.	Points. Scored.
Production	180	126·36
Constitution	135	115·00
Type	135	120·00
Totals	450	361·36
Additional points for progressive breeding		61·56
Grand Total		422·92

Winners' Production Scores.

	lb. Butter.	Points.	Age.
Grand dam, Stately...	191·7	23·00	Over 6 teeth.
Dam, Kitty...	435·9	52·30	Over 6 teeth.
Daughter, Favourite	255·3	51·06	Under 4 teeth.
		126·36	

Breeding.—

Stately, 14 years. By Cadet, out of Royal, by Warrior. Warrior g g son of Major. Note—Udder partly gone.

Kitty, 5 years. By Reform, out of Stately.

Favourite, 2 years. By Earl of Burradale, out of Kitty.

A Successful Innovation.

The result of the new system is best expressed in this extract from the report of the committee presented to the Annual Meeting of Members of the Bangalow A. and I. Society, by the President, William Fredericks, Esq., 26th May, 1915:—

One notable feature that your Committee introduced into their schedule of prizes at the late Show was the judging of dairy cattle on points for production, type, &c. This was a big departure, but the exhibitors wherever it was possible rose to the occasion, though not without feelings of the impracticability of the scheme.

There was fair competition and *the results were most satisfactory*, thanks to the splendid assistance that the Society received from the Department of Agriculture (Dairy Branch), through their district officer Mr. L. T. MacInnes, who rendered most valuable aid.

Some difficulties which were anticipated were satisfactorily met and overcome. Slight improvements, suggested after the first practical demonstration, will be introduced for the next Show.

Further Improvements.

The improvements referred to in the foregoing report were considered and adopted by the committee on 15th September, and are in their main features in accord with the principles and suggestions made to the Society by Mr. O'Callaghan when conferring with its committee on 12th August, in conjunction with the writer, who also was consulted on the 15th September.

1. For calculating production points. The age of the cow to be taken as from the date of commencement of the test period cited. Exhibitors to produce a certificate from the tester, or association, stating age of cow at the time the test began in all classes under six teeth.
2. That entries be judged for type as a "dairy cow," and not for any particular breed.
3. In the Pure-bred Breeders' Association classes the production of a cow to be taken from any period of 273 days, conforming with the regulations governing their testing scheme. In the case of the Herd-testing Association classes the production period to be 360 days, commencing from 1st March, 1915.
4. The ratio of production to constitution and type to be altered from 4 : 3 : 3 to 10 points for production, 5 points for constitution, 5 points for type—thus making production equal to the other two as was originally suggested to the conference which first considered and endorsed the scheme.
5. The maximum yields of cows to remain unaltered for the present, *i.e.*, 500 lb. of butter for cows over six teeth, 400 lb. for cows six teeth and over four, 300 lb. for heifers four teeth and under.
6. Score cards to show the following information :—
   (1.) Lactation period.
   (2.) Dates of calving immediately prior to and subsequent to the testing period.
7. Score cards to be made out in triplicate, viz., for the Society, the exhibitor, and the public (for attaching to the pens).
8. In the trio and dam and daughter classes, points for progression and retrogression, to be calculated on the points scored for production of each animal entered, taking the oldest generation as a base. This is in order to deal more equitably with the production from cows of different ages.
9. Judge's remarks for constitution and type to be entered in general terms on all score cards.
10. All prizes to be 30s. and 15s. for first and second prizes respectively.
11. Additional classes to be added to this section :—
    (*a*) Bull, not more than six permanent teeth, to show production of dam.
    (*b*) Bull, no permanent teeth, to show production of dam.
    (*c*) Dam and daughter to be judged the same as in the trio class, each to show own production.

The System endorsed and adopted elsewhere.

The Murwillumbah (Tweed River), Mullumbimby (Brunswick River), and Lismore (Richmond River) Agricultural Societies are embodying in the schedules of their coming shows, to be held in November, classes to be judged on the lines pioneered by the Bangalow Society and described in this article. The North Coast branch of the Australian Jersey Breeders' Society has also endorsed and approved of the system, and are this year giving twelve guineas in prizes at the Mullumbimby and Lismore Exhibitions, to be competed for on similar lines. It is to be sincerely hoped for that the herd-testing movement begun on the North Coast will spread over other dairying districts, and in its wake that the system of judging dairy stock by production and points will be generally adopted in the show rings.

The next best thing to originating a good idea is to copy one. To perceive in others that which will tend to advance and uplift, and to apply it in one's own case, is probably to do almost as much benefit as to initiate the scheme, for thereby the seed sown and germinated is cared for and spread over a wider area. In thus so quickly and energetically following the example set them, the societies mentioned above are also worthy of the commendation, though to the Bangalow Society must remain the first and chief credit.

They are all thus helping to realise their educational responsibilities, and proving their right to be regarded as a force to advance the principal industry of their district. Their action in this matter is worthy of emulation by others.

The following classes are to be opened for competition at the forthcoming North Coast shows:—

TWEED RIVER AGRICULTURAL SOCIETY, 10th and 11th November, 1915.

Class.	Production Records to be submitted.	Prizes. First.			Prizes. Second.		
		£	s.	d.	£	s.	d.
Bull, 6 teeth and over	From 3 daughters	2	2	0	1	1	0
Cow, more than 6 teeth	Own record ...	2	2	0	1	1	0
,, 6 teeth and under	,, ,, ...	2	2	0	1	1	0
Trio (grand dam, dam, and daughter) ...	,, records ...	2	2	0	1	1	0

MULLUMBIMBY AGRICULTURAL SOCIETY, 17th and 18th November, 1915.

Class.	Production Records to be submitted.	Prizes. First.			Prizes. Second.		
		£	s.	d.	£	s.	d.
Cow, more than 6 teeth	Own record ...	1	1	0	0	10	6
,, 6 teeth and under	,, ,, ...	1	1	0	0	10	6
Heifer (Durham and Grade Durham), no permanent teeth.	Dam's ,, ...	1	1	0	.....		
Bull (Grade Durham), under 12 months ..	,, ,, ..	2	2	0	1	1	0
(Donated by North Coast Branch of the Australian Jersey Society.)							
Bull, any breed and age	From 3 daughters	3	3	0	......		
,, ,, (no more than 4 permanent teeth)	Dam's record ...	1	1	0	.....		
Dam and daughter	Own records ..	1	1	0	......		

LISMORE AGRICULTURAL SOCIETY, 24th AND 25th NOVEMBER, 1915.

Class.	Production Records to be submitted.	Prizes.
		£ s. d.
Bull, 6 teeth and over	3 daughters	1 10 0
Dam and daughter	Own records	1 10 0
Cow, any age	Own record	1 10 0

In addition to the foregoing the North Coast branch of the Australian Jersey Breeders' Society is giving several specials to value of £7 7s. to be judged on similar lines.

BANGALOW AGRICULTURAL SOCIETY, MARCH, 1916.

Section.—Cows tested under the United Pure-bred Breeders' Association of Australia Scheme.

Class.	Production Records to be submitted.	Prizes. First.	Prizes. Second.
		£ s. d.	£ s. d.
Bull, 6 teeth and over	3 daughters'...	1 10 0	0 15 0
Cow, more than 6 teeth	Own . ..	1 10 0	0 15 0
,, 6 teeth and under...	,, ...	1 10 0	0 15 0
Bull, not more than 6 teeth	Dam	1 10 0	0 15 0
,, no permanent teeth	,, ...	1 10 0	0 15 0
Trio (grand dam, dam and daughter)... ...	Own	1 10 0	0 15 0
Dam and daughter	,, ...	1 10 0	0 15 0

Section.—Cows tested in Herd-testing Association.

Class.	Production Records to be submitted.	Prizes. First.	Prizes. Second.
Bull, 6 teeth and over	3 daughters'...	1 10 0	0 15 0
Cow, more than 6 teeth...	Own	1 10 0	0 15 0
,, 6 teeth and under	,, ...	1 10 0	0 15 0
Bull, not more than 6 teeth	Dam's ...	1 10 0	0 15 0
,, no permanent teeth	,, ...	1 10 0	0 15 0
Trio (grand dam, dam and daughter)... ..	Own	1 10 0	0 15 0
Dam and daughter	,, ...	1 10 0	0 15 0

This makes a grand total of twenty-six classes to be competed for at the forthcoming exhibitions under the new order of things. Of these, eleven are for bulls and fifteen for females.

There is a probability of several additional specials being added to these classes before the shows eventuate.

It will thus be seen that the small beginning made last year at Bangalow has spread considerably, and within twelve months the idea has been taken up by all the principal Societies on the Tweed-Richmond River Districts.

The Tepary Bean.

A Hardy New Haricot.

W. M. CARNE, Botanic Gardens.

Tepary beans, or teparies, are natives of the arid parts of Arizona and Northern Mexico, where they have been cultivated by the Indian inhabitants since prehistoric days. Professor Freeman, of the Arizona Agricultural Experiment Station, has isolated some forty distinct strains, of which at least two, the white and the yellow, have become of commercial importance in the dry south-western portions of the United States.

Distinguishing Characters.

Teparies belong to the species *Phaseolus acutifolius*, and may be distinguished from the common kidney haricot beans (*Phaseolus vulgaris*) by their smaller leaves, flowers, and pods, and slender habit. The pods are about 3 inches long when ripe; thin, tough, and of no use as food even when green. The seeds are of many colours, though, owing to the prejudice against coloured beans, the white variety is the most important. The flowers are white in the white-seeded variety, and pink to purple in the coloured-seeded forms. The vines are semi-trailing, slender, producing much less foliage than other beans, and are very prolific and drought resistant.

Teparies as a Farm Crop.

The beans are smaller than the ordinary imported haricots, but in the opinion of one of the leading stores of Sydney, with many branches in the suburbs, are not inferior. They expressed the opinion "that the appearance of the haricots was the best, but that if anything the tepary beans scored in flavour." The writer's experience confirms this.

It is claimed in America that owing to their greater power of absorbing water they are more digestible and more suitable for canning than the common haricots.

It must be pointed out that so long as the farmer has to compete against imported beans grown by coloured labour there are small prospects for the commercial growing of dried beans. Haricot beans can usually be landed in Sydney from Rangoon and elsewhere at a cost of about 5s. 6d. per bushel of 60 lb. Yields of 20 to 25 bushels are obtained with a little irrigation in Arizona. Trials at Yanco and Bathurst under irrigation have given similar results. The question of a reasonable market is of more importance in deciding the commercial possibilities of these beans. The results, so far, are not favourable.*

* At this time, August, 1915, haricot beans are quoted at 17s. per bushel wholesale. This price is of course the result of abnormal conditions.

At Yanco the plants ripened seed in twelve weeks from sowing. These were hand-picked, and a second crop was ready for threshing four weeks later. Under non-irrigated conditions the results naturally vary with the seasons. Teparies are very hardy, and can be relied upon to produce some crop even under very dry conditions.

As a Garden Crop

Whatever the value of the tepary bean as a farm crop there is no doubt of its right to a place in the vegetable garden, especially in the drier parts of the State. The shelled beans, if the pods are picked as soon as the seeds are fully formed, make an excellent green vegetable. Green pods are ready for pulling in from eight to ten weeks, ripe pods ten to twelve weeks, from planting under favourable conditions. New pods are produced freely as the others are removed. The dry beans are cooked like ordinary haricots.

Mr. A. Holcombe writes enthusiastically of his results at Burren Junction during a dry season :—" The bean is exceedingly prolific and nutritious, and, furthermore, hardy. In fact, I am absolutely satisfied as to its utility." The seed was sown in October, 1914, attained its full height of 18 inches in three weeks, the vines commencing to dry off six weeks later. They were only watered once.

Mr. Cheel, of the Botanic Gardens, has tried these beans at Hill Top and Ashfield. He has found them very prolific and hardy, and believes that they are more suited to light soils, tending rather to an excessive production of leaf on richer heavier soils. Seeds raised at Hill Top in a sandy loam were sown at Ashfield in October, 1914, in rich black soil. In January green pods were ready for pulling.

Mr. Cheel remarks, " The seeds are smaller than the dwarf lima or haricot beans, but seem to me to have a superior flavour to either when cooked as a green vegetable."

Garden Culture.

Teparies may be sown from September to February, in rows about 2 feet 6 inches apart, the seeds 3 to 4 inches apart in the row. They are very hardy, require little water, and seem to prefer the lighter and poorer soils.

Seed for Distribution.

The Department has on hand seed of the white and mottled varieties, which is available for distribution in small quantities for trial. Applications should be made to the Director, Botanic Gardens, Sydney.

Farmers' Bulletin No. 92.

A Bulletin on " Apple and Pear Growing " by W. J. Allen, Fruit Expert, with a section on insect pests of the apple and pear by W. W. Froggatt, F.L.S., Government Entomologist, and W. B. Gurney, F.E.S., Assistant Entomologist, has just been issued, and may be obtained free on application to the Under Secretary and Director, Department of Agriculture, Sydney.

Weeds of New South Wales.

J. H. MAIDEN,
Government Botanist of New South Wales and Director, Botanic Gardens, Sydney.

FROM time to time lists are drawn up as to the most dreaded weeds in New South Wales. For example, at the Weed Conference of January, 1895, I made the following statement, which was published in the Report of the Conference:—

"*A tentative list of the worst twenty weeds.*—The noxiousness of a weed is not always absolute; a weed may be noxious to a farmer and not to a pastoralist. It may be a nuisance in one district, and not in another; on river flats and not on higher land on the same property.

Bathurst Burr (*Xanthium spinosum* L.).
Sweet Briar (*Rosa rubiginosa* L.).
Lantana (*Lantana camara* L.).
Prickly Pear (*Opuntia spp.*).
Star Thistle (*Centaurea calcitrapa* L.).
Cockspur (*Centaurea melitensis* L.).
Saffron, or False Star Thistle (*Kentrophyllum lanatum* L.).
Black or Spear Thistle (*Carduus lanceolatus* L.).
Cape Weed (*Cryptostemma calendulaceum* R.Br.).
Stinkwort (*Inula graveolens*).
Sorrel (*Rumex acetosella* L.).
Dock (*Rumex crispus* L. and others).
Smart Weed (*Polygonum spp.*).
Purple Top (*Verbena bonariensis* L. and others).
Corn Gromwell (*Lithospermum arvense* L.).
White Thistle, or Yellow Poppy (*Argemone mexicana* L.).
Mallow Weed (*Modiola caroliniana* L.).
Thorn Apple (*Datura stramonium* L.).
Nut Grass (*Cyperus rotundus* L.).
Wild Oats (*Avena fatua* L.)."

This was admittedly to some extent guess-work, but guess-work based on experience.

We have now an opportunity of making a list of weeds with some approach to exactness. The Officer-in-charge of Local Government, with my assistance, has been compiling lists of certain plants which have been declared noxious in different municipalities and shires. The list is a very long one, and many of the weeds are not of general importance, at all events at present. I have taken the records of two years as regards the nineteen most prevalent weeds, and by adding together the number of

municipalities and shires that proscribed these weeds we arrive at figures which show the opinion in which these weeds are held in different districts. Each year these figures will be more exact.

I submit two tables, one up to May, 1914, and another up to June, 1915. If these tables be examined, it will be seen that six weeds stand at the head of both lists, but that the Black Thistle, Paterson's Curse, and Cape Weed are struggling for the sixth, seventh, and eighth places.

There are other changes in the list in progress, and if farmers and others will carefully peruse these lists they will be pretty safe in considering very seriously any weed mentioned therein, should they notice them on their property.

WEEDS proclaimed noxious within Municipalities and Shires in the State of New South Wales.

Weeds.	Up to May, 1914. Number of Municipalities.	Shires.	Total.	Sequence.	Up to June, 1915. Number of— Municipalities.	Shires.	Total.	Sequence.
Xanthium spinosum (Bathurst Burr)	87	98	185	1	91	100	191	1
Rubus fruticosus (Blackberry) ...	39	43	82	2	42	46	88	2
Centaurea calcitrapa (Star Thistle or Chinese Burr)	33	48	81	3	34	49	83	3
Rosa rubiginosa (Sweet Briar) ...	27	43	70	4	28	43	71	4
Xanthium strumarium (Noogoora Burr)	21	42	63	5	23	45	68	5
Carduus lanceolatus (Black Thistle or False Scotch Thistle or Spear Thistle)	46	6	52	6	46	7	53	6
Cryptostemma calendulacea (Cape Weed)	22	15	37	7	22	15	37	8
Echium plantagineum (Paterson's Curse or Purple Bugloss or Blue Weed)	9	28	37	8	10	32	42	7
Carthamus lanatus (Saffron Thistle or False Star Thistle)	9	26	35	9	10	27	37	9
Lantana camara (Lantana) ...	15	13	28	10	17	13	30	10
Argemone mexicana (Mexican Poppy or Binneguy Thistle or White Thistle or Blue Thistle or Prickly Poppy or Yellow Poppy)	7	18	25	11	7	17	24	11
Inula graveolens (Stinkwort) ...	7	14	21	12	7	14	21	12
Eichhornia crassipes (Water Hyacinth)	7	12	19	13	7	12	19	14
Datura stramonium (False Castor Oil Plant or Thorn Apple or Green Stem or Purple Stem) ...	11	7	18	14	12	8	20	13
Nicotiana glauca (Tree Tobacco or Tobacco Bush)	5	13	18	15	5	13	18	15
Hypericum perforatum (St. John's Wort)	5	11	16	16	6	11	17	16
Phytolacca octandra (Red Ink Plant or Dye Berry or Ink Plant) ...	11	1	12	17	12	1	13	17
Solanum cinereum (Narrawa Burr)...	5	7	12	18	5	7	12	19
Ricinus communis (Castor Oil Plant)	8	3	11	19	9	3	12	18

The Inland Fisheries of New South Wales.

H. K. ANDERSON, Fisheries Department, Sydney.

WHILE at first sight there does not seem to be any very close connection between the inland fisheries of our State and agriculture generally, an examination of the facts will clearly show that every resident, town dweller and ruralist alike, is vitally concerned in the edible fishes stocking our rivers. Farmers can do much to conserve this national asset, not only by themselves adhering to the regulations governing the netting and angling of fresh-water fish, but by encouraging such an adherence to the rules on the part of others. In this way a substantial increase in this attractive variation of their customary food supply may be effected.

A considerable amount of ignorance still exists on this subject, and it is with a view to placing all the facts in a concise form that the following notes have been compiled.

Value of our Inland Fishes for Food.

There is no limit to the value of our fresh-water fishes as food for the people. For flavour and nutritive qualities they are second to none, while higher prices are often paid for Murray Cod than for any other kind of fish on the market.

At present the number of fishes in our inland waters is great, in spite of the fact that many thousands perish year after year in times of drought. Nature has made them prolific, the number of eggs deposited by most of them being enormous, doubtless with a view to counterbalancing the effects of droughts; but with human agencies at work on their destruction, every care must be taken to preserve them. This is a growing country, where self-contained resources will be of the utmost value in the future.

The Reasons for the Present Regulations.

The regulations under the Fisheries Act, (1) restricting the killing of fishes under specified sizes; (2) prohibiting the capture by any means whatever in certain seasons; and (3) prohibiting certain methods of capture, are those to be dealt with.

1. The reason a limit has been imposed, making it illegal to kill edible fishes under a specified length, is because to kill any valuable fish until it has reached maturity is obviously unwise. Maturity is the stage in the growth and development of the fish when it is capable of depositing its eggs, and the approximate average size at maturity, which, however, cannot always be definitely stated, has been proclaimed as the size under which fish may not be killed. Some fish reach maturity when quite small; for instance, the Fresh-water Herring, at 5 inches; others do not become mature until

very much larger, viz., the Murray Cod, which is lawful game at 15 inches. A table, giving the various fresh-water fishes of great edible value, with the size at which they may be killed, is appended.

After a fish has deposited its first season's eggs, which as a rule it does once in every twelve months, no great loss to the river, creek, lagoon, or lake ensues if it is killed, for the reason that it has left behind it eggs to the number, in some cases, of 100,000 or more, many of which will grow to maturity and so keep up the stock in the waters.

SIZES OF VARIOUS INLAND FISHES WHEN THEY BECOME LAWFUL GAME.

Rainbow Trout	10 inches.
Brown Trout	12 ,,
Loch Leven Trout	12 ,,
Murray Cod	15 ,,
Trout Cod	10 ,,
Golden Perch or Yellowbelly	9 ,,
Silver Perch or Grunter	8 ,,
Macquarie or Mountain Perch	8 ,,
Fresh-water Catfish	8 ,,
Australian Grayling	9 ,,
Australian Bass or Eastern Fresh-water Perch	9 ,,
River Blackfish or Slippery	7 ,,
Fresh-water Herring	5 ,,
Bony Bream or Hair-backed Herring	6 ,,
Murrumbidgee Lobster or Crayfish (crustacean)	8 ,,

2. At certain seasons it is imperative that all valuable food fishes be protected and left as much as possible undisturbed. This is the average period determined after careful study of their habits, when Nature prompts fishes to deposit their eggs. Some inland fishes make nests in water 3 or 4 feet deep, on sloping banks, in which the eggs are placed; for instance, the fresh-water Catfish. Some kinds, such as the Trout, seek shallow water running over clean gravel, where they, too, make a nest or "redd," and the eggs are deposited. It should be pointed out that the nest of the Catfish is a hollow made by the fish in the soft, sloping bank of a river or lagoon, the floor of which is covered with small stones, sticks, and mussel shells. Here the eggs are deposited and watched over by the male Catfish until the fry commence their independent existence. The Trout makes a hollow in the fine gravel of the river bed, deposits its eggs, and then covers them over with a little pile of gravel, where they remain until hatched out. Others again, as the Silver Perch, select fairly deep water, where there is an eddy, near a steep bank, the eggs being released by the parent fish near the surface of the water.

If disturbed by anglers or net fishermen while preparing the nest, &c., the whole or part of the eggs of any fish may be lost, while if fish that are ready or nearly ready to shed their eggs are killed, the whole of the eggs are lost to the stream. As a consequence, fish become scarce, and it is a very costly and difficult matter to re-stock the water.

Persons interested in fish, fishing, and the habits of fishes, are invited to make notes of their observations, and forward them to this Department.

3. Certain methods of killing edible fish must be prohibited, for otherwise it would be possible very soon so to reduce their numbers in a lake, &c., river, as to make it valueless as a source of food supply. This has often happened through a lack of knowledge, thoughtless people killing every fish caught, both large and small, the small ones being frequently thrown away, instead of being returned to the water. All undersized fish should be carefully returned alive to the water.

In order to guard against the wholesale destruction of small fishes, regulations have been made governing net-fishing, and it is illegal to use in inland waters any net the meshes of which are less than 4 inches from knot to knot. All fish that have not reached lawful size can escape through such a net.

Killing fish by means of explosives is prohibited. An explosion of dynamite for instance, in the middle of a pond or waterhole 30 yards long would probably kill every fish in it. Not many of them could be used, hence the remainder are wasted. A very heavy penalty is imposed on anyone caught using explosives in this way.

Wire-netting traps are very often used in our rivers; these are prohibited by law for the reason that they catch every fish that goes in, both large and small, and a great many valuable food fish are thus destroyed every year. If the trap happens to be carried away by a flood, it is washed down-stream, perhaps for some miles, before being caught in some obstruction: here it remains, and goes on catching fish which are unable to get out, and perish.

Distribution of Inland Fishes.

The rivers of New South Wales are divided into two main systems—the Eastern system, which drains all the country east of the Dividing Range, and whose waters flow into the sea between Point Danger at the Northern boundary and Cape Howe at the Southern extremity of the New South Wales coastline; and the Western system, draining the country on the Western slope, all of which flows into the Murray River.

The fishes which are indigenous to or natives of the Eastern flowing waters are not, as a rule, found in the waters flowing West, nor are the fishes natives of the Western system, as a rule, found in Eastern waters. Exceptions, of course, exist.

The edible fishes of the Eastern slope are:—

Australian Bass or Eastern Fresh-water Perch,	Fresh-water Mullet,
Macquarie or Mountain Perch,	Common Eel,
Australian Grayling,	Fresh-water Herring,
Fresh-water Catfish,	Bullrout,
	Asiatic Carp.

Those of the Western slope, whose waters all flow into the Murray, are:—

Murray Cod,	Macquarie or Mountain Perch,
Trout Cod,	River Blackfish or Slippery,
Golden Perch or Yellowbelly,	Fresh-water Catfish,
Silver Perch or Grunter,	Bony Bream or Hair-backed Herring.

That excellent crustacean, the Murrumbidgee Crayfish, is a very important adjunct to the food supply.

The Macquarie Perch and Catfish are found in large numbers in nearly all the western, and also in certain eastern, waters. Observations by persons interested, with reports as to those two species, are invited.

Rainbow, Brown, and Loch Leven Trout have been liberated in both eastern and western flowing streams. The Snowy River, which runs through into Victoria and thence to the South Pacific Ocean, is classed among the eastern waters, as the kinds of native fish it contains are identical with those of the eastern slope.

Spawning Time of Inland Fishes.

The fishes of the western waters, most of which deposit their eggs largely during October and November, are protected during those months, to the extent that set line and net-fishing is absolutely prohibited, but, at the same time, anglers are permitted to fish in western-flowing streams with one rod and line or one hand line, to which rod and line or hand line not more than one hook may be attached

In eastern waters the only fish that is at present protected during the spawning season is the Australian Bass, which must not be fished for or caught by any method whatever during the months of July, August, September, and October, excepting in the Clarence, Richmond, and Hunter Rivers, where the close season is from 1st May to 31st October.

The trout, no matter what variety, must not be fished for or captured by any means from 14th April to 31st October in each year, whether in eastern or western waters.

Smaller Fishes.

In addition to the edible fishes mentioned above, we have a number of miniature species, which do not attain a greater length than about 6 inches, These include several small members of the Perch family, Gudgeons, Smelts, Minnows, also several crustaceans, including yabbies and shrimps, which provide food for the edible varieties inhabiting the same waters.

Explanation of Fisheries Regulations as Applied to Inland Waters.

Legal Nets—All Nets must be made of Twine.—Drum or hoop nets to consist of not more than three hoops forming a drum, the outer hoops to be not more than 5 feet apart, with a diameter not exceeding 4 feet, covered with netting made of twine, the mesh of such netting not to be under 4 inches Such drum-nets may be provided with two wings made of twine, each to be of not more than 10 feet in length, the mesh of wings to be not less than 6 inches.

Meshing or gill nets not to exceed 30 yards in length, with meshes not less than 4 inches, measured diagonally from corner to corner.

Illegal Nets and Fish Traps.—Any net other than the drum and gill nets specified above is illegal in inland waters.

The use of wire-netting as a meshing or hauling net, or in any other way, for the purpose of taking fish is not allowed.

Cages, fish-traps, drums, or any other similar device made of wire-netting or any substance other than twine, with wings so attached as to impede the passage of fish on either side of the trap, for the purpose of catching fish, are illegal.

Legal Fish Traps.—A fish trap constructed of netting made of twine, with meshes complying with the above description of legal drum and gill nets, is legal.

Anglers' Nets.—Anglers may use legal nets in waters not closed to netting for the purpose of providing fish food for themselves, but no fish may be caught for sale except by a person to whom a fisherman's license has been issued.

Measurement of Nets.—Mesh of nets to be measured diagonally by suspending a half-pound weight on opposite knots, and measuring the space between them. Nets to be soaked in water for five minutes prior to measuring.

Lines.—By a set-line is meant any line that is left unattended. Not more than six hooks may be used on any line.

The term "set-line" embraces cross-lines, springers, and any other form of fishing-line that is not held in the hand, whether attached to a rod or not.

Lines in Closed Waters.—In waters that have been declared close fisheries, and in the close season, October and November, of each year, the use of one, only, rod and line, or one, only, hand-line, with not more than one hook attached, is legal; but in such waters it is illegal to use more than one rod and line, *or* one hand-line, to which not more than one hook may be attached.

Spinning baits armed with two or more hooks are to be considered as one hook.

It is illegal to transfer fish of any species from one water to another without the authority of the Fisheries Department. Penalty, £5.

Trout.—It is illegal to catch or attempt to catch trout with any implement other than rod and line, supplemented by gaff and landing net.

Artificial or natural flies, insects, larvæ, fish, flashes, and other spinning baits may be employed.

Any trout below the legal length of 10 inches which may be captured must be immediately returned to the water.

Close Season for Trout.—The close season, during which trout may not be taken by any method of capture whatsoever, shall extend from 14th April to 31st October, inclusive, of each year.

Close Season for Murray Cod, Trout Cod, Golden, Silver, and Macquarie Perch.—The close season for indigenous fresh-water fishes throughout the Murray System shall be from 1st October to 30th November, inclusive, in each year.

Fishermen's Licenses.—Every professional fisherman must be provided with a fisherman's license, and if using a boat as an accessory to his business, he must also possess a fishing-boat license before he may legally catch fish for sale. Such license may be obtained from the Treasury, Sydney, or the local Clerk of Petty Sessions.

Explosives.—It is illegal to use any explosive or any firearm for the purpose of taking or destroying fish.

Penalties.—The maximum penalty for breach of these Regulations is £40.

Seed Testing for Farmers.

The Department is prepared to test vegetable and farm crop seeds. Reports will be given stating the germination capabilities of the seed, its purity, and the nature of the impurities, if any.

Communications should be addressed to the Director, Botanic Gardens, Sydney. Not less than 1 ounce of small seeds such as lucerne, or 2 ounces of large seeds like peas, should be sent. Larger quantities are to be preferred. Seeds should be accompanied by any information available as to origin, where purchased, age, &c.

If a purity report only is desired, it should be so stated, to secure a prompt reply. Germination tests take from six to twenty days, according to the seed.

Poultry Notes.

JAMES HADLINGTON, Poultry Expert.

November.

The hatching season just concluded, so far as good percentages are concerned, appears to have been one of the most successful of recent years. Better selection of the breeding stock and the improved conditions under which they have been kept have no doubt contributed to this result. A gratifying feature, too, is the way in which poultry-keepers, for the most part, have acted both on the advice tendered them in these notes and on the lessons taught by their own bitter experience in the past with these late hatchings. The result has been that on many farms the incubators have been closed down at the proper time, and rather than run late, many poultry-keepers will no doubt make a small hatching during February and March, and escape the worst rearing period. This apparently drastic action on the part of poultry-keepers who, while having hatched slightly less chickens than they would have wished to do, have had sufficient resolution to dispense with late hatchings is to be commended, and I feel sure that those who have abandoned this unprofitable practice will find their rearing much more successful.

Rearing.

While this undoubted advance may be viewed with considerable satisfaction, there is much need for improvement in the methods of rearing in vogue. The wastage in chicken life constitutes one of the most serious drawbacks to individual success, and also to the progress of the industry generally. When it is considered that owing to the short profitable life of the hen as an egg-producer the entire stock on a poultry farm, with perhaps certain exceptions (such as in the case of valuable breeding stock), must be replaced every two years, and that half the product of the hatch will probably be cockerels, the importance of securing good hatches and the minimum of wastage in rearing becomes obvious. Reducing this to figures and taking general averages as a basis, it must be remembered that close upon 1,000 chickens must be hatched to secure 400 good pullets, after deducting 50 per cent. for cockerels, losses, and some culls; this too, would be a fair result. In isolated instances better results might be obtained, but on most poultry farms these results are not realised. Thus it will be seen how largely the question of successful rearing influences the ultimate result on a poultry farm, and is undoubtedly the biggest factor in success or failure. Given successful rearing, and most poultry will pay. Good chickens well reared are the foundation of success.

Secure Good Development.

Many poultry-keepers rely too much upon the class of food fed, and too little upon the conditions governing development. Of course, conditions and environment are main factors in securing growth; given ordinary good sound food and plenty of it, coupled with suitable environment, satisfactory development will be secured; but no matter how good or varied the food or how well fed the birds may be, if these essentials are lacking, satisfactory growth will not be obtained. The importance of this is not generally recognised. It is not sufficient for chickens to be kept merely alive; quick growth means less expenditure of food, economy of accommodation and labour, prime quality and higher prices for the cockerel portion of the output, better egg production from the pullets, and the foundation of future successful rearing and general results.

Degeneracy in some Breeds.

As bearing upon the subject of hatching results and the several factors that enter into the calculations, the reply to a correspondent seeking advice as to his non-success in hatching, and especially as it presents some apparent difficulties, may be of general interest. The case as stated was that a well-known brand of incubator was being used in which sixty eggs were set, made up as follows:—twenty each of White Leghorns, Black Orpingtons, and Chinese Langshans. On the first round of the incubator the results were—eighteen White Leghorns, no Orpingtons, and no Langshans hatched. On the second round of the incubator the same number of each of the same breeds was put in. This time the results were seventeen Leghorns, seven Orpingtons, and four Langshans, the remainder being dead in the shell. It was also stated that although the eggs of these two breeds failed in the incubator, ten to twelve chickens were hatched out of a setting of the same breeds when set under hens. My reply to this query stated that the general causes of "dead in the shell" were as follow:—some weakness in the parent stock, stale eggs, or faulty incubation. Since, however, in this case the factor of faulty incubation could be eliminated, seeing that the Leghorns in the incubator hatched satisfactorily, the cause would seem to be one of the other two; either some weakness in the parent stock in the two breeds in which failure occurred, or stale eggs had been put in the incubator, as it is well understood that while hens will hatch out fairly stale eggs, the incubator will usually fail to do so. The cause is probably the same in either case, seeing that the germ is weakened as the eggs become stale. But taking into consideration the breeds mentioned it is not unlikely that weakness in the parent stock is the root cause of the trouble.

This opens up a subject that is of vital concern to poultry-keepers generally, *i.e.*, that at the present time all is not well with some of the breeds in use, or at any rate some strains of them, and poultry-keepers are warned that a very great departure from original standards and type and size is creeping into some of these breeds, and unless this degeneracy is arrested by breeders being more careful in the selection of their breeding stock not only will

there be difficulty in hatching and rearing, but the breeds must inevitably lose the characteristics they stand for. Much of this has been brought about through careless matings, lack of knowledge in selection, and the notion prevalent with egg-farmers that small birds are the best layers. The consequence has been that some of these so-called Orpingtons and Langshans are simply small black fowls, in many instances of less weight than that of the light-weight Leghorns, with but few of their characteristics left, and with their dual-purpose qualities lost.

It should be obvious, that if specimens of a breed which, according to accepted and original standards, should weigh 5 lb. to 6 lb. at maturity, are little more than half that weight, that breed must be degenerate. Fortunately some breeders are keeping their birds up to requirements, and provided they maintain their standards, and if only other poultry-keepers will be warned of the dangers besetting them, the downward course may be arrested.

Laying Competition Weights.

The recognition of this trouble has led to the enforcement of minimum-weight standards for the different breeds entering for the laying competition at the Hawkesbury Agricultural College. The difficulty of educating the beginner in matters of type has been fully recognised, but in regard to weight, the case presents no difficulty whatever, and the adoption of minimum weights should at least ensure fair development, and thus retain the stamina of the breeds to a certain extent, and in the case of the heavier breeds, their dual purpose qualities. The minimum weights at seven months of age in each case set out for the competition are now as follow :--

Leghorns	3½ lb.
Sicilian Buttercups	3½ ,,
Chinese Langshans	3½ ,,
Minorcas	4 ,,
DUAL-PURPOSE BREEDS.	
Orpingtons	5 lb.
Plymouth Rocks	5 ,,
Langshans (modern)	5 ,,
Sussex	5 ,,
Rhode Island Reds	4½ ,,
Wyandottes	4½ ,,

It might be pointed out in this connection that this is not a question of show birds *versus* utility; but of preserving the breeds with all they stand for from a utility point of view.

Birds under these weights cannot be regarded as representative specimens of their respective breeds; and the fact that they come up to those standards of size is a guarantee of some physique. It is not denied that small, even weedy birds, may be good layers, but if the essential characteristics of the various breeds and strains are to be perpetuated it is obvious that these undersized specimens should be altogether eliminated.

Agricultural Bureau of New South Wales.

NOTES COMPILED BY H. ROSS, Chief Inspector.

REPORTS AND NOTICES FROM BRANCHES.

NOTE.—While gladly publishing in these columns the views of members of the various Branches of the Agricultural Bureau, it is pointed out that the Department does not necessarily endorse all the opinions expressed.

Bloom Hill (O'Connell).

A meeting of the above branch was held on 18th September at O'Connell. Fourteen members attended, and two new members were enrolled. An interesting paper on general utility sheep was contributed by Mr. S. McKibbin, and was followed by a discussion on various points raised.

Carlingford.

A lecture on vegetable growing was delivered by Mr. E. Cheel, of the Botanic Gardens, to members of this branch on 4th September.

VEGETABLE GROWING.

Mr. Cheel advocated more extensive cultivation of vegetables in back yards, and produced specimens of his own growing in his yard at Ashfield, which included well grown mint, parsley, horse-radish, water-cress, kale, cabbage, and turnip-shaped radishes. A photograph was shown of Mungabella cabbages of enormous size which he had grown himself, and of which he distributed some seedlings.

The best varieties of cabbage were considered to be Succession, St. John's Day, and Mungabella, while for a supply of "greens" he recommended Ragged Jack Kale and Aphis-proof cabbage, and the tops of white and swede turnips. The edible Hibiscus or "Okra" of the West Indies should be given a trial. The methods of its cultivation were described, as well as the many uses to which the plant and its fruit are put.

Mr. Cheel displayed a well-arranged and varied assortment of bean seed, which included all the popular varieties, as well as many others not so well known. He also exhibited preserved specimens of several kinds of beans, which served to illustrate his remarks.

All the seeds and specimens exhibited had been grown by the lecturer himself, and he described the merits of the different varieties, also the results of his experiments in the effort to improve and popularise new varieties. The importance of beans was emphasised, not only because of their value as an article of diet, but also because, in common with all leguminous plants, their growth added nitrogen to the soil. The several kinds of velvet beans, which Mr. Cheel had satisfied himself were not poisonous, were described. He hoped to see these more largely cultivated.

The following were among the different varieties described :—

Soy Beans.—These were very rich in oil, and the seeds were often difficult of germination. They produced valuable food, both for human beings and for stock.

Mung Beans.—May be used green or dried, and even as split peas.

Lima Beans.—Should be largely grown by farmers. Reported that 1,160,000 sacks were produced in California during 1910. The wholesale price in the Sydney market during the current year was 5d. per lb.

Haricot Beans.—Also in large demand, and bringing 17s. per bushel in the Sydney market.

Dwarf Limas.—Burpee's Improved Bush Lima was the best. Specimens of pods and seeds exhibited were of extraordinary size.

Butter Beans.—Davies' Kidney, White Wax, and Wardwell Kidney were recommended as the varieties giving the best results.

French Beans.—A variety known as Magnum Bonum was very strongly recommended as an improvement on the well-known Canadian Wonder.

Tepary Bean (also known as the "Desert Pea" of Arizona).—Described as a non-climber, very hardy and very prolific.

Madagascar Bean.—Should not be grown where children can get at it, owing to the poisonous qualities of the bean in its immature stage.

Mr. Cheel saw no reason for Australia being so dependent on other countries for supplies of vegetable seed. He urged vegetable growers to produce their own seed, and to conduct experiments with a view to producing improved varieties and to the building up of an Australian industry, for which purpose the present time was very opportune.

Collie.

This branch held the usual monthly meeting on 25th September, there being a fair attendance of members. A discussion took place on the merits of the various kinds of wheats in the local experiment plots, Sunset and Firbank coming first in the opinion of members.

Coobang.

The usual monthly meeting of this branch was held at the residence of Mr. Benno Seidel on 24th September. Mr. Jelbart was in the chair.

A paper was read by Mr. H. E. Drabsch, from which the following paragraphs are taken :—

Hay-making and Stack-building.

Firstly, the farmer should decide which day his hay is fit to cut, and having commenced on that day, should continue until the work is completed.

If the hay is intended for market, it should be cut very green, that is, before the flag becomes too dry and the wheat is in full flower. If for farm use, it should be left a little longer, so that there will be some grain, especially when the farmer has no other grain to add to the chaff. Oaten hay should on no account be cut too green, as it will become bitter, and stock will not eat it readily. It is best left until nearly ripe.

Before commencing to cut, see that the binder is in good order, so that there will be no delay during cutting operations. The binder should be set so that the sheaves will not be too large, as large sheaves do not dry evenly and become stained in the centre. The only advantage of large sheaves is the saving in twine, which is not worth consideration when the hay is being discoloured. When a quantity has been cut, say, one day's cutting, it will be necessary to have it stooked. It is not advisable to stook immediately after cutting, unless the hay is nearly ripe ; a day's drying on the ground will help to keep it from heating in the stook. On the other hand, it must not be left too long on the ground, as the under portion will be stained.

In making the stook itself, do not make a large one—firstly, because the hay is liable to heat, and become musty, and, secondly, if rain falls it will be found that the large stook takes the water and holds it, or at least enough to stain the hay. All staining and heating must be prevented to obtain a good marketable sample. Damaged hay will not bring within £1 per ton of undamaged hay, and in ordinary easons that is the whole profit that the farmer makes. A good stook should not contain more than twelve sheaves, and not less than eight. Each sheaf should be lifted by hand and dumped hard on the ground, in the place where it is to stay and to form part of the stook, and should be given just enough lean to make a nice shape. Dump it hard on the ground in order that the sheaf will stand well and not be blown down, and to make the butt of the sheaf straight, which will be better for building the wall of the stack.

The carting is also very important, as much hay is spoiled by either carting in too soon or leaving it out too long in the field. In dry districts it is often spoiled by being left out too long, as it loses most or all of its valuable colour and nutriment. Other farmers make the mistake of carting in too soon, when it becomes heated in the stack, again losing its colour and becoming like silage. I find that in dry districts seven or eight days are sufficient to leave the hay in the stook, unless it has been cut extra green. In wet districts it requires twelve to fourteen days in the stook. If the hay been cut on the ripe side, it should be carted two or three days sooner. The best way to ascertain if it is fit to cart, is to take a handful of hay from the centre of the stook and twist it round in the hands, when it should break, but not too freely. The knots should still show signs of moisture ; if the knots are dried out, it has been left too long.

If possible two waggons and five men should be employed for stacking, so as to get it in quickly; otherwise it will dry out too much, or perhaps rain may come and cause further damage. Start carting from the outside rows first, and work towards the centre after the same style as cutting with the binder, so that none will be carted too green. In building the stack, the first thing to ascertain will be the size and shape. If only one waggon and two men are available, it will be best to build the stack round and small, so that the work will not be too far away. If there are two waggons and five men, the large stack will be found the best, especially if built oblong, with round corners. Square cornered stacks are not advisable, as the crossed sheaves provide a good start for mice to enter and damage the hay. When the size has been marked off, start stacking from the outside, and fill in the centre as the work proceeds. Starting with a stook in the centre is not good, as it flattens out as the stack goes up, gradually letting the centre sink. In building the body of the stack place the butts outwards, as they will hold much better than with heads out. Care should be taken not to pack the outside row any tighter than the inside rows, in fact, the inner rows should be packed the closest, otherwise the centre will settle more than the walls, and on opening it will be found that the sheaves are canted the wrong way, and that water has entered the stack instead of running off. When the wall is up to the required height, which should be in proportion to the size, it will be then necessary to make the eaves, but before doing so the centre should be further raised by placing a tier with heads outward without an outside row. This should bring the centre 4 or 5 feet higher than the walls. The eaves are then proceeded with by projecting the butts 4 or 5 inches beyond the walls, so that any water coming off the roof will drop to the ground and not run down the walls. In making the roof, draw each tier in a few inches, but not too far, or the heads of inside sheaves will be exposed. Right through the roof the inside sheaves must be placed heads outward. This will help to keep the centre up, and make a smooth slope to run off any water that may happen to get through the top sheaves. The top should be completed with some short sheaves, which have been put aside for the occasion. Secure with wire over the top, and hang a weight on each end so that it can settle with the hay. A stack built in this way will be secure against any rain that may fall. It is advisable to thatch right away, however, as unthatched stacks always have a certain amount of waste through the butts on the roof being exposed to the weather. A stack of straw should be on hand for thatching, where there is no thatching grass available, as is mostly the case in wet districts.

During the discussion on the paper, most of the farmers present gave their experiences and opinions on the subject. The question as to the cost of hay-making and stacking was dealt with, and it was estimated that it would work out as follows on the basis of a crop of 1 ton to the acre:—

	s.	d.
Cutting	4	0
Twine	1	6
Stooking	1	0
Carting and stacking	5	0
	11	6

Harvesting will be dealt with at the next meeting of the branch.

Coradgery.

The annual meeting of this branch was held at the residence of Mr. W. Moss, "Hillview," on 18th September, when there was an attendance of twenty-five members.

The President's report stated that eight meetings had been held during the twelve months, with an average attendance of fifteen per meeting. The membership roll kept up, now being fifty-five. During the year three lectures and demonstrations had been given by officers of the Department of Agriculture, and papers had been read by several members. The seed wheat competition was not quite the success anticipated, but nevertheless results were of instructive value. This year, with twenty-six entries and the promise of good crops, most satisfactory results were anticipated. Returns

had been obtained from twenty-four members which showed their increased area under wheat as against last year to be 3,937 acres, viz., 10,910 acres for 1914, and 14,847 for 1915; made up of Federation 8,896 acres, Hard Federation 717 acres, Yandilla King 2,872 acres, Purple Straw 560 acres, Firbank 438 acres, Warren 220 acres, Steinwedel 208 acres, Rymer 195 acres, Bunyip 190 acres, and smaller areas of other varieties. In addition to the above the same twenty-four members returned 504 acres of oats.

The Treasurer's report showed a very satisfactory credit balance, portion of which it was proposed to expend on the formation of a library.

The election of officers for the coming year resulted as follows:—Chairman, Mr. W. E. Taylor; Vice-Chairmen, Messrs. G. C. Harris and J. L. Whitmill; Hon. Secretary, Mr. J. Clatworthy; Treasurer; Mr. H. N. Marriott.

It was decided to stage an exhibit at next year's Parkes and Peak Hill shows.

It was agreed that members be invited to contribute papers at the next meeting on the "Lessons of the Drought."

After partaking of afternoon tea, kindly provided by Mrs. Moss, a visit was paid to the experimental plots, where the benefits of fallow, manure, and up-to-date methods of cultivation are being demonstrated. The results of both grain and fodder plots will be anticipated with much interest.

Coraki.

This branch held the usual monthly meeting on 14th September, when two new members joined.

The meeting took the form of a question meeting. Each member was allowed the privilege of asking one or more questions on any subject relating to farming or dairying, and the answers were supplied by other members who had the requisite knowledge. This interchange of opinions and suggestions resulted in much valuable mutual help.

Gerringong.

A very interesting lecture was given by Inspector R. N. Makin, of the Department of Agriculture, on 23rd September, on the cultivation of fodder crops, with special reference to fodder conservation.

Fodder Crops.

In the course of his remarks, the Inspector said that evils arising from the neglect of a proper system of draining on a great many South Coast farms, and the effect of draining, especially in those districts subject to heavy rain, were matters which should be given more serious consideration by farmers. How to select and test seed for sowing, the best distances in and between the rows of maize for fodder, and varieties to grow, were dealt with, and questions answered in passing. The results of the Dapto Boys' Corn-growing Competition were screened, and it was suggested that the Gerringong branch of the Bureau might take a leaf out of Dapto's book, and start something of the kind in the district. In connection with the conservation of green maize, different systems of stack-building and styles of silos were illustrated on the screen, and farmers were strongly advised to make a special effort to conserve as much fodder as possible. Many farmers were afraid to take the matter up owing to labour being scarce. This, it was pointed out, was a strong argument in favour of fodder conservation. During the winter months, when the days were short, cutting winter crops, such as Planter's Friend, absorbed a great deal of time. As a rule, two days' supply was cut. With silage, the crop was cut when the days were long, and carted in big loads to a convenient centre. The labour of feeding was thus reduced to a minimum. It was suggested that farmers might mutually combine to carry out such work.

Glenorie.

At the meeting held on 25th September, Mr. T. A. Nicolson read a paper, from which the following is extracted :—

Spraying for Codlin Moth.

The object of spraying is to poison the grub when it hatches from the egg where it has been laid by the moth, which will be in the opening of the flower. It is, therefore, necessary to spray before the calyx or top of the flower closes up and imprisons the grub. This period will vary with different varieties, and must be a matter for growers to observe for themselves. The regulation time for the first spraying is within five days after the petals have fallen from flower, but a difficulty here presents itself, viz., a variety may have two or more settings of bloom. Carrington apple is a notorious example, and apparently will maintain its reputation this season. I think that a second spraying, to catch the second bloom, would be beneficial. The regulation further provides for a second spraying between four and six weeks after the petals have fallen. I do not regard this second spraying with very kindly feelings, and I think, if the first is done thoroughly and is not washed off immediately by heavy rains, a second spraying to deal with the offspring of those spared by the first should not be necessary. The regulations also provide for a third spraying nine weeks after the petals have fallen. This is quite unnecessary for early varieties, and if complied with would spoil the appearance of the fruit for market, as the apples would be too matured to throw off the arsenate of lead. These remarks apply to local conditions, and not to other districts where other varieties which remain longer on the trees are grown.

A description of the operation itself can be summed up in one word—thoroughness. It will be noticed that the calyx of the flower almost always points upward or outward; it is, therefore, advisable that the spray should come downward, and a nozzle with a turn will prove most effective. For very high trees a stand on the spraying outfit is of assistance, pending the invention of some air-craft—that would be ideal for the purpose. Many growers, who have only recently taken to the spray-pump, experience a difficulty in determining when they have done the tree properly. Some may say when the spray begins to drip off the tree it has had enough; but the blooms may not be done, and a sure way is to examine the cup of the flower and see if it is full of spray. A little practice will enable one to determine when to stop. Then I would say, endeavour to give every part of the tree a bath; there is always the possibility of eggs being laid on leaves as well as on flowers. As the object of the first spraying is to drench the tree, a nozzle that is not too fine should do. It is simply a question of the value of the material (more will be used with a coarse nozzle) and of the sprayer's time, as a finer nozzle will distribute the spray better, but take longer. In summarising the position I would say, be sure and do the first spraying soon enough, and do it well. It is not half so easy to do the second as thoroughly when the leaves are fully developed, thus covering the fruit. Use a pump that will force the spray well into the tree; and last, but not least, give the outfit an overhaul and a trial run before commencing. It will not be possible for the man who combines citrus with apple and pear culture to pick up and pack oranges and spray at the same time.

Henty.

On 15th July Mr. J. G. R. Bryant, Assistant Fruit Expert, visited Henty to give a practical demonstration in connection with budding, pruning and grafting fruit trees.

Demonstration in Orchard Work.

Mr. Bryant showed how to make resin wax for binding fruit trees where grafted to keep the weather out. The resin wax is composed of the following:—4 lb. resin, 3 lb. beeswax, 2 lb. mutton fat, and a little linseed oil; when thoroughly mixed a cloth is soaked, and this, when dry, wound round the places grafted.

He recommended that trees should be pruned so as to give them a good spread, allowing a space of about 18 inches to 24 inches between branches, and gave a practical demonstration of how to do this; also how to prune so that shoots might come out right along the branches.

The annual meeting of the branch was held on 11th September, under the chairmanship of Mr. R. O. Eulenstein.

The balance-sheet, which had been duly audited, showed a credit balance of £5 16s.

The election of officers resulted thus:—Chairman, Mr. A. P. Habrecht; Vice-Chairmen, Messrs. R. O. Eulenstein and S. Lavis; Hon. Secretary and Treasurer, Mr. L. Eulenstein.

Some discussion took place on an aphis that was attacking fruit trees, and it was decided to ask Mr. Bryant, Assistant Fruit Expert, about it when in the district for the purpose of a budding and grafting demonstration which was expected at an early date.

For next meeting, Mr. R. O. Eulenstein was asked to give some notes on soil liming, and Mr. D. H. Schultz one on ensilage.

Mr. J. Hadlington, Poultry Expert, gave a lecture under the auspices of the branch on 14th September.

POULTRY FARMING FOR PROFIT.

Mr. Hadlington said he hoped that his lecture would not be interpreted as an advocacy of carrying mixed farming beyond certain limits, for the farmer might have too many irons in the fire. However, he did consider that poultry should have a place on every farm, even if it was only for domestic use, while on many farms it might be carried much further than this with advantage, and become a source of considerable revenue.

Mr. Hadlington then went on to illustrate, by means of lantern slides, the various methods applicable to keeping poultry on the farm, and gave it as his opinion that the general farmer who essayed to keep poultry would need to either "fence in" or "fence out." That was to say, if various crops were growing that it was undesirable the poultry should get into, either an area should be fenced off for a poultry enclosure, or in the case of small crops, such as vegetables, these should be enclosed and the poultry run on a free range outside. This was considered the best method where practicable. In this case, he advocated the colony system of housing the poultry.

If the Mediterranean breeds were kept, owing to their being non-sitters, it would be necessary to use incubators and brooders. But if the Asiatic breeds were kept, chickens could be reared in the natural way. The necessity of hatching the chickens early in the spring was insisted upon, and also that sufficient chickens should be hatched each year to replace half of the laying stock, thus replacing the whole every two years. This was absolutely necessary to poultry becoming a paying proposition.

Fowl tick (*Argas persicus*) was prevalent in districts not far away from Henty, and it was only reasonable to suppose that if it was not already here poultry keepers might make its acquaintance at any time. Various slides were screened, showing the fowl tick, and the blood disease with which it inoculated the fowl. The lecturer showed that it could be successfully combated.

Kellyville.

At the October meeting Mr. H. Reid presided over a fair attendance of members.

After the usual business had been disposed of, members discussed the recent visit of Mr. C. W. Burrows, Assistant Inspector of Agriculture, when he gave a demonstration in the use of explosives for subsoiling, &c. Those who attended the demonstration highly appreciated the careful manner in which Mr. Burrows explained correct and safe methods of handling the explosives. It was shown that, even with the increased cost of explosives, it was a much cheaper way to remove large stumps, and it also resulted in a great saving of hard work.

Arrangements have been made by this branch to stage an exhibit at the next Castle Hill show.

Lower Portland.

An interesting paper on "Farm Life" was read by Mr. R. M. Smith at the meeting of the above branch on the 30th August.

The paper dealt with various means by which farm life might be made more systematic and business-like, more attractive to the younger generation, and more profitable to the farmer himself. He stated that "the city man with a thorough business training and but poor knowledge of farming, who turns to agriculture, will often make a good living where a man who had been born and nurtured on a farm, but lacking in business qualifications, would starve."

An animated discussion followed, and Mr. Smith was heartily thanked for his paper.

A lecture on "Scale and Insect Pests, &c.," was delivered under the auspices of this branch in the local School of Arts, on 8th September, by Mr. W. W. Froggatt, F.L.S., Government Entomologist.

Scale and Insect Pests.

The speaker prefaced his lecture by describing the advantages gained by a knowledge of Economic Entomology. The time had arrived when there were so many pests of both the scale and insect classes, that were not only a source of much annoyance to the farmers and orchardists, but were responsible for the destruction of large quantities of produce of various kinds which otherwise would have returned reasonable prices in the market. Not only were the farmers subject to this treatment by the pests, but practically every garden, whether in the city, suburbs, or country, were attacked in various ways by moths, beetles, and insects of various kinds. He, therefore, wished to point out the advantages gained by encouraging the birds and also the friendly insects that lived on the destructive pests.

Lantern views of the many insects that were of value to the orchardist and farmer were screened. One view shown was that of a large wasp common in this locality, which burrowed holes in the ground, and fed mainly on locusts, large numbers of which had often been found in the burrows. Views of the White Louse, Red Scale, San José Scale, Indian Wax Scale, Cottony Cushion Scale, and many others were shown. All of these pests had parasites living on them, so were more or less kept in check by them. The Cottony Cushion Scale had proved very destructive in California, where it had no parasites at all. As a result, American entomologists had come to Australia to collect specimens of parasites to introduce into Californian orchards. The various Fruit Flies were also screened, and the lecturer explained that while these had parasites, they were of no value to orchardists, as they were found only in the uncultivated wild fruits in the bush. The Vine Moth also had parasites in the form of small wasps, which kept the pest in check to some extent, but a sure method of eradicating the pest was to spray the vines with arsenate of lead.

The next shown was one of the commonest of all, as well as being one of the most troublesome; this was the Codlin Moth. Experiments had proved that spraying with arsenate of lead not only kept the pest in check, but if thoroughness and consistency were combined it could be killed right out; bandaging the trees was also helpful in trapping the pest. It also has a parasite in the form of a tiny scale-like insect, which gets on the back of the grub and sucks the vitality out of it.

The tiny "Thrip," in a highly magnified form, was next shown, and discussed at some length. This could only be dealt with by spraying the blooms with a solution of tobacco and soap, using the tobacco at a strength resembling strong tea, and just enough soap to make it stick to the plants.

Another very troublesome pest was the "Cabbage Moth." A good method of dealing with it was to dip the young plants in kerosene emulsion before planting, thus killing all the larvæ then on them.

Special interest was taken in an illustration of the "Tomato Moth," as it was of local and very seasonable importance. It is a night feeder, and consequently not readily seen. The plants could be sprayed to advantage with arsenate of lead, but a very effective method of killing them was to make a mixture of 1 oz. of Paris green and 16 oz. of bran, and spread it on the ground round the butts of the plants; the grubs would eat this readily, which meant certain death.

Many other pests were shown, including the common House-fly and the Cockroach. Many of the insectivorous birds were also illustrated, and their points of value enlarged upon.

At the conclusion of the lecture many questions, on various subjects, were answered by Mr. Froggatt, who received a hearty vote of thanks.

Matcham.

A meeting was held on 18th September, which was well attended by members.

Papers were read by members on the following subjects:—Tomato culture, by Mr. A. D. Lockwood; San José scale, by Mr. W. R. Crossland; and Pumpkin growing, by Mr. S. C. King.

Milbrulong.

The monthly meeting was held on 20th September. The subject for discussion was the noxious weeds of the district.

A good deal of discussion ensued as to whether wild oats should be classed as weeds, some members contending that they were really a blessing, because of their value as feed, and because they compelled farmers to spell their ground. If it were not for wild oats some farmers would grow wheat year after year till the ground was exhausted. The majority, however, were of the opinion that wild oats should be classed as weeds, because the wheat yield suffered more from wild oats than all other weeds.

After a lengthy debate the list of the ten worst weeds was fixed as follows:—Wild Oats, Cape Weed, Wild Mustard, Wild Turnip, Wild Poppy, two weeds known locally as Iron Weed and Summer Weed, or Water Weed, Saffron Thistle, Paddy Melon, and Nettles.

At the next meeting the subject for discussion will be hay making and stacking.

Narrandera.

The ordinary monthly meeting of the above branch was held on 25th September, when Mr. H. L. Tepper, Chairman, presided.

Grading Seed Wheat.

A discussion arose out of a statement made by Mr. Stening in his recent lecture with reference to the necessity for grading seed wheat before pickling.

Mr. Pearce said that such a subject could not be too much enlarged upon; it was an absolute necessity if farmers wanted to have anything approaching clean crops.

The Chairman said the farming community was in need of a cheap grader.

Mr. Rogers said it was difficult to find a wheat crop in which there was not a mixture of Federation.

The Chairman said in closely settled parts of the district it might pay farmers to co-operate and purchase graders. There would be a great many weeds sown next year if the grain was not graded.

Parkesbourne.

The annual social and picnic in connection with this branch was held on 17th September. A very pleasant afternoon was spent by members and a large number of local residents.

A lantern lecture was delivered in the evening by Mr. R. G. Warry, Demonstrator in Apiculture. The Secretary reports that the lecture was of a most instructive character.

Ponto.

The monthly meeting of this branch was held on 31st August, when the following paper on meteorology was read by Mr. H. L. Lane :—

Meteorology.

This is a subject of great interest and importance to country people ; it is also one of much difficulty, but some facts and theories in connection with meteorology may give you a greater chance of estimating coming weather than perhaps you have been able to use hitherto.

Do not at once put me down as another foolish weather prophet ! You will learn nothing from these notes which will enable you to predict weather for months, or even weeks ahead, but I do say this, you may be enabled thereby to see sometimes a little further and a little more clearly ahead than before.

No doubt many of you have laughed at some forecast made by our Government Meteorological Office, which has turned out to be utterly incorrect, but, as with a great many other things, a better understanding of the work the office does would change your laughter to interest and appreciation. I would like you to give the weather officials fair play, and that can only be done by understanding how much of their work is successful, in spite of many and great difficulties. You will see soon what some of those difficulties are.

Every weekday the chief papers publish a weather chart. Now, that chart is for our benefit and education. A large number of stations, scattered over the whole of Australia, send in telegraphic reports giving atmospheric pressure, direction of wind, humidity, and other details. These details are arranged by the Meteorological Office, according to a certain system, and we get the result as a weather chart. Once we are capable of reading these charts, and connecting them with the weather signs about us, we are in a position to estimate, often with great accuracy, what the weather will be for the following few days. You will say, " why make any such estimate when you already have the published forecast ?"

Well, first, your paper may be one day or perhaps two or three days old, and the forecast will be just that much out of date too ; and secondly, it is frequently possible to estimate for a much greater time ahead than the period contemplated by the forecast ; and thirdly, by observing local weather signs and using them with the chart as a key, you can detect alterations in the weather system not foreseeable when the forecast was made.

Some people think of weather as having no special order or system, whereas to a large extent it is very orderly. To explain this order I want you to examine this chart, which shows what is called the "Southern Hemisphere high-pressure belt." This belt is caused by the flowing down from equatorial regions of air which has been heated, has risen and expanded, and then overflowed the surrounding air, and on reaching more southerly latitudes has become jammed owing to the smaller circumference of the earth. This creates a pile of air with consequently greater pressure. Owing to causes which cannot now be gone into, this high-pressure belt becomes broken up into a series of revolving masses, known as anti-cyclones. South and north of these, and sometimes in between, are cyclones. Do not imagine that cyclone, as here used, means a furious storm—it means merely winds travelling in a circle. This whole chain of cyclone and anti-cyclone is moving steadily from west to east, though subject to varying speeds, and sometimes complete stoppage for a time. The cyclone is made up of winds travelling round a centre, and in the same direction (in this hemisphere) as the hands of a clock. The anti-cyclone is revolving in an opposite direction. The cyclone is a low-pressure area—a hollow in the air surface—whilst the anti-cyclone is a mound. You will see on the chart these high and low-pressure areas are represented by a series of concentric or curved lines—these lines are known as isobars, or lines of equal pressure. To make his chart, the meteorologist jots on a map the barometer readings received by wire, and joins those of the same value by lines ; this gives him his weather chart. Then by noting the character and number of the curves so drawn, and other details, he is enabled to make a forecast. This is where one of his chief difficulties comes in. If he could have stations out at sea, east, south and west of Australia, sending in telegraphic reports of barometer readings, he could draw more extended charts and forecast with greater accuracy. Often he bases his forecast on particulars necessarily gained only on the Australian mainland when some disturbance is moving up from the Southern Ocean, which, had he known of it, would quite alter his prediction. Frequently, long dry spells have broken up owing to a disturbance coming in over New South Wales from the Pacific Ocean, a backward surge of the weather system, quite unforeseeable by readings from land stations.

The forward edge of an anti-cyclone is characterised by S. and S.W. winds, and you will see that as these winds are circling up from cool southerly regions they are likely to

be cool or cold winds. As our rains are almost always from the low-pressure area, just in advance of the high-pressure, you will see why rain is so often followed by cold (in winter) or cool (in summer) S.W. winds. The central area of the high-pressure is generally calm and clear, and it is then we get our heavy frosts in winter and calm clear days and nights in summer. The rear edge of the high-pressure brings warmer northerly or east winds, which are so often the prelude to a change to cloudy or rainy weather. When you get the strong northerly or N.E. winds you say this will blow up a change. But the change is not being blown up, it is already following behind in the next low-pressure. In winter the low-pressure areas that bring us rain come up from the south as tongues which push up in between two advancing high-pressure areas. In summer our best rains come in monsoonal tongues which push in from the north. These are low-pressure areas, laden with moisture from the warm Indian Ocean.

The advance of a low-pressure area bearing rain can generally be detected a day or two before its arrival by long streamers of cirrus clouds (called mares' tails sometimes) stretching out from the west in fan-shape; they are really parallel but the perspective gives the fan appearance. If they are merely wisps waiving in different directions no particular importance can be attached to them, but if they stream out in well defined lines you can almost certainly predict the approach of a low-pressure cyclonic area bringing a change of weather.

You will see then that by watching the chart for the first appearance on the coast of West Australia of cyclone or anti-cyclone, and noting in conjunction therewith the direction of the wind and cloud appearances, you have a means of estimating approaching weather several days before it reaches New South Wales. With experience you will see how different arrangement of the isobars brings different types of weather, and you will constantly find growing interest in watching these different types as they appear on the weather chart.

Temora.

A meeting of the Temora branch was held on 25th September.

Feeding-off Wheat Crops.

Mr. D. Sinclair, dealing with the question of feeding-off crops, stated that he had made it of more benefit to his stock than to the crops for grain purposes. He first of all made sure that the plant was sufficiently rooted to prevent sheep pulling it up. One year he turned sheep on 200 acres of crop in May and left them there till the middle of September, when good showers fell, and he harvested 18 bushels to the acre of fine wheat. On another occasion he fed-off till into spring and got 20 bushels to the acre. Last year he fed till July, but owing to the very dry spring the crops were so low that he could hardly cut them with the stripper. That was the only year he had been dissatisfied with the feeding-off. This year he fed-off till June. Crops now are very grassy, but he could not say whether this was due to insufficient feeding-off. It would take ten years to prove the matter. They would have to take into consideration yield of grain, value of stock fattened for sale, and what the ground gained in fertility. If sheep could be fed on the crop during the winter months and the feed-paddocks spelled, it meant that a greater number of sheep could be carried during the whole of the year.

Mr. de Little considered Mr. Sinclair had opened a very wide field for discussion and thought. He quite agreed in what Mr. Sinclair said, and suggested that the Bureau pass a resolution as to feeding-off crops with horses, sheep, and cattle, asking members how long it took stock to fatten, and whether feeding-off combated diseases in wheat. He had fed down crops and found that, instead of their being patchy like the present year, if eaten down till July they became more even and easier to strip. Feeding down rank patches prevented powdery mildew and rust, while it also, like pruning, produced more shoots. Judgment must be used in putting big stock on crops. It might not be advisable in a year of drought.

Mr. Sinclair said that he might have got an additional half bushel last year if he had not fed-off, but what did he gain from fattening his stock? Probably the gain from fattened stock was greater than the return from an additional half bushel of grain per acre.

Mr. Mallinson favoured feeding-off. His son at Beckom sowed in March and got good rain. He fed 120 horses on the crop, and now it was higher than the fence. If that crop had not been fed down it would have been out in ear long ago.

Mr. Warren also favoured feeding-off. He followed the principle of putting a lot of sheep on, and feeding-off in a fortnight. He fed his crops off last year early in June to the last of July for various paddocks. He fed-off owing to mildew. The early crop came away well, but owing to the dewy nights it developed mildew. The crop fed-off to the end of July yielded 12 bushels to the acre, but had it not been fed-off it would have been badly affected with mildew. It was not a matter of drought with his crops, because there was plenty of moisture.

Mr. REINHOLD stated that last year he had part of his crop fed-off, but could not get sufficient stock to eat off all the crop. The crop eaten off he could not cut with the binder. He thought there was considerable risk in feeding-off a crop that was growing satisfactorily.

Mr. REYNOLDS said that feeding a crop off wanted for hay was a great mistake unless it got a good start in March. In that case it should only be topped in May. In a year like the present, if crops were eaten off too low the weeds were likely to take full possession of the paddock. He instanced a paddock under fallow for two years. This was eaten off till late, and was now overrun with weeds. If the wheat had not been eaten off so bare, he believed the result would have been better. He favoured eating off only early-sown and very clean crops.

Mr. MALLINSON: If ground is weedy or grassy, there is a danger of the weeds choking the wheat.

Mr SINCLAIR said that in the year that he fed-off and secured an 18-bushel yield, the sheep tramped the surface of the ground down well, and very hard. One year he was short of feed for stock, and turned horses and cattle on to the crop. It was a wet year, the stock bogging up to their knees all over it. From that he got a return of over seven bags to the acre.

Mr. DE LITTLE considered that any farmer must use his own discretion as to how far it was advisable to feed his crop off. Twenty years ago he had fed-off crops with sheep at the rate of thirty-five to the acre. One year he had 3,500 sheep on a little over 100 acres of crop for a fortnight. On a crop 6 inches high he had proved by experience that thin stock would fatten in six weeks. A sheep will increase in weight at the rate of 2 lb. per week on a 6-inch crop. They should consider three points in connection with the subject: Firstly, feeding-off made the crop more even to strip; secondly, the profit from stock fattened on it; and thirdly, the fact that feeding-off the rank growth checked diseases in wheat.

Toronto.

The annual report of this branch showed that during the year useful work had been done in several directions. The credit balance now stands at £9 11s. 9d.

United Peel River.

An instructive lecture on "Apiculture" was delivered by Mr. R. G. Warry, Demonstrator in Apiculture, to members of this branch on 5th October. He explained in detail the best methods of working the apiary. The lecture was illustrated by means of lantern slides.

Upper Belmore River.

The monthly meeting of this branch was held on 24th September, and was well attended. Mr. J. M. Bannan presided. A discussion took place as to which were the most suitable grasses for mixed stock in the coastal districts, and it was the opinion of the majority of members present that Couch, Clover, and Paspalum had proved to be the best.

Wetherill Park.

At the annual meeting of this branch the election of officers resulted as follows:—Chairman, Mr. A. H. Clarke; Vice-Chairman, Mr. P. J. Cotter; Treasurer, Mr. P. J. Cotter; Hon. Secretary, Mr. L. Rainbow.

A general discussion took place on noxious weeds of the district.

Wolseley Park.

The following paper by Mr. A. J. Garner was read and discussed at the last meeting of the above branch:—

THE SOILING SYSTEM.

Needless to say, the soiling system is not of Australian origin. Rather is it the outgrowth of conditions which in the main do not at present apply to this country, viz., very restricted areas for individual farms and abnormally high-priced land. Nevertheless, the

idea has been readily adopted by progressive persons in some parts of these States, and is pursued to a fair extent in New Zealand. In countries such as Denmark and Holland, where the quantity of land available in proportion to the population is comparatively small, this system is carried on in its most scientific form; with what great benefit to the rural community and the country generally is shown by the great strides these places have made in the dairying industry, and the relative wealth of the landowners, the majority of whom make a successful living on areas of from 10 to 50 acres, and even less. In Australia, where we are used to farms mostly running from 300 to several thousand acres, this system is as little appreciated as it is understood. But a number of years' experience in three of the dairying States of the Commonwealth have given the impression that, in spite of the comparatively large farms held by most dairymen, much greater success would be achieved if very much more attention was paid to smaller areas and the work was carried on in a scientific manner. These small farms could be worked to their full capacity for dairying, while the balance of the holding might be used for other purposes, or in a good many cases disposed of to the great advantage of the present owner and his landless neighbours. In this district we find that an average of about 4 acres is required to keep a cow for about seven months; the balance of the year she usually spends in a more or less unprofitable and semi-starved condition. Why? Because, as a rule, the landowners trust to the wide scope of country at their disposal, and to kindly but long-suffering Nature, to provide sufficient sustenance, with little or no artificial aid. Under the soiling system we should, right from the start, carry at least one cow to 1 acre, and keep her in good and profitable condition throughout the whole year, so that, in addition to the extra money each cow would earn during the five months she is now idle, she would be in perfect condition with the advent of spring to start off in full profit, and not require, as is at present the case, to build up her wasted tissue for two or three months before being in a condition to produce her normal quantity of milk.

With this explanation and indictment, we may proceed to consider the methods of the soiling system and its practical application. The difference, in the first place, between this system and grazing is that, while by the latter method cattle roam over a more or less restricted area at their pleasure, doing the best they can for themselves, and in most cases with little or no supervision, by the former method the feed is grown and fed out to the animals in the correct proportions and most economical manner. Of course, where the acreage available warrants it, as is the case here, there is no reason why grazing to a certain extent should not be allowed also, but the main idea is always to grow sufficient feed to ensure that each individual member of the herd will get just as much as she can profitably utilise, remembering that a cow is a machine for milk production, but before producing the milk she requires a certain amount of nourishment for her bodily upkeep, and this must be supplied before she can profitably and fully exercise her function as a milk producer.

The ground should be kept constantly under cultivation, and a rotation of crops should always be coming on; as soon as one crop is cut the soil should be turned over and another planted suitable to the climate and season. In this system the stock are never allowed to feed off the growing crops, the fodder being in all cases cut and fed out to the animals. One great benefit gained from this arrangement is that the cattle, being fed in one particular place, a very large proportion of the manure is available to be worked into the soil. It should either be immediately gathered up and placed on the land, or put into cement-lined pits, so that all the chemical constituents possible will be preserved, and made available for return to the soil.

This item of manure conservation is one that is sadly overlooked by most farmers. Each cow, it is estimated, will provide in the course of a year about 11 tons of liquid and solid manure, and allowing that only half of this is available and used, what an immense benefit to the land! Under the soiling system, therefore, instead of the land becoming impoverished year by year it is all the time growing richer and more valuable, not only through the large quantities of manure being added, and the ground constantly stirred up, but, through the stubble of the various crops being ploughed in, humus is provided, and in the case of nitrogenous crops such as peas, vetches, &c., nitrogen is stored in the soil.

We must remember that, according to good authorities, first-class pasture land will only average 12 tons of grass per annum, while with fodder crops anything up to 40 or 50 tons, and even more, can be grown. If each dairyman could be persuaded to try for a start only 10 acres of his farm, and thoroughly cultivate it under the soiling system, what a revolution we should have in dairying in just a few short years! Those who have not experimented with or studied this question would be simply amazed at the results. Every dairyman would be well advised if he provided sufficient fodder to give each cow an allowance of 60 lb. per day for five months in the shape of ensilage. As it would not

be necessary every year to use all of this supply, he would be continually accumulating a store for a time of unusual stress. The farmer's own judgment and experience should be the best guide as to the particular kind of crop he should grow, only there should be something growing all the time, and always make provision each year, as though an immediate drought was assured. Early Amber Cane is particularly well adapted to this district, and has yielded up to 20 tons to the acre. Drumhead cabbages and Chou Moellier should also do well, and in other districts have yielded up to 50 tons per acre. Peas and vetches will also do well, and mixed with oats or barley, and either fed green or in the shape of ensilage, they help to make a well-balanced ration. Undoubtedly the great obstacle in the way of Australian dairy farmers' success is not the severity of the climate or poverty of the soil, but just the reverse, and it leads them to trust too implicitly to Nature, instead of relying on their own efforts.

DEPARTMENTAL NOTE.—The above paper contains hints that are well worth being followed by dairy farmers. Over and over again it has been proved that dairying in most districts does not pay if the cattle have to rely on natural pastures only. Hap-hazard methods, and the occasional cropping of an acre or two for either summer or winter green feed, does not meet the case. A systematic crop rotation, such as is advocated in the above article, should be followed by every dairy farmer. Coastal, especially South Coast, farmers have of late years proved for themselves the value of green fodder, in the shape of either wheat, oats, barley, sorghum or maize. A few suggestions with reference to crops that may be grown in the Rosewood district are not out of place here.

Winter green feed :—Wheat, especially fairly early maturing varieties, such as Thew, and for later sorts Marshall's No. 3 and Cleveland. This should be followed by Skinless barley and peas mixed, and later on by oats. All these fodders will come in at a time when the natural pastures are bare, and will have been cut in time to permit the land being ploughed and got ready for sorghums or maize.

Supposing a farmer intends to put in 5 acres, the following directions may act as a guide :—

2 acres Thew wheat,
1 acre Marshall's No. 3 wheat,
1 acre Skinless barley and peas or vetches,
1 acre Algerian oats.

The wheat, oats and barley should be sown in autumn at the rate of 1 bushel per acre, with the addition of 1 cwt. superphosphate per acre. If peas are sown with the other cereals, then these should be sown at rate of ½ bushel per acre in addition to ¾ bushel of wheat, barley or oats, as the case may be.

As soon as these fodders are cut, all available farm manure should be carted on to the land, ploughed in, and the ground got ready for summer fodders, such as maize and sorghum. Early Leaming and Red Hogan are two varieties eminently suited for the Tumbarumba district. Sow 3 acres of these at the rate of 15 to 20 lb. per acre, in rows 3 feet apart; the remaining 2 acres can be sown with Early Amber Cane with 6 to 8 lb. of seed per acre, also in rows 3 feet apart. Thus the land is occupied nearly the whole year round, and green fodder is available at almost any time when it is needed. Too much attention cannot be given to the conservation of manure and its subsequent application to the land.

Yetholme.

On the 20th September the annual meeting of this branch was held at Brookland Park, the residence of Messrs. Donaldson.

However, owing to the sad death of the late Chairman, Mr. F. J. McDonald, the main business was postponed until the next meeting. Mr. Berry temporarily presided.

Mr. Makinson, Organising Officer, explained the objects and advantages of the Bureau to an attentive audience, and his remarks were much appreciated. As the result of his efforts this branch should become established on a much firmer footing. The real advantages of the Bureau to farmers are now certainly more keenly recognised.

Mr. Wm. Garrard has generously offered a prize of 10s. 6d. for the best paper for the year. He has also promised a paper on horse-breaking for next meeting.

Orchard Notes.

W. J. ALLEN.

NOVEMBER.

Fungous Diseases of the Apple and Pear.

POWDERY Mildew and Black Spot may make their appearance if the weather is cool and moist. In such cases the trees should be sprayed, as soon as the fruit has set, with either Bordeaux mixture or lime-sulphur (summer strength in both cases).

It is not uncommon for bluestone to russet the fruit if applied at all strong, and Bordeaux mixture must therefore be used fresh, and with the utmost care. Directions for mixing sprays may be had on application to the Department of Agriculture.

When applying a fungicide, such as Bordeaux mixture or lime-sulphur solution, the addition of arsenate of lead (commercial form) for the destruction of leaf-eating insects is permissible.

Cultivation.

It is most important that the cultivation of the soil should receive special attention at this season of the year, as keeping the ground well worked to a depth of several inches checks evaporation. After each rain or irrigation the whole of the orchards and vineyards should receive a thorough cultivation immediately the ground is dry enough. Do not wait until a hard crust forms on the top of the soil, but put on all available help and have the surface broken up immediately. Keep the trees and vines well worked around with a fork hoe or pronged fork. The plough should never be brought into requisition at this time of the year, except, perhaps, in special soil conditions or in a very wet, cool district, but the soil should be kept stirred to a depth of 4 or 5 inches with a good cultivator.

On land liable to wash, provision should be made for the carrying away storm waters by ploughing out a furrow where the least fall occurs to prevent a large head of water collecting in any one place. On very steep land, it is obvious that the soil should not be worked fine, but kept as the plough leaves it.

Fruit Fly.

In districts where the fruit fly has shown up in previous seasons particular care should be taken to pick up and destroy all fallen and infested fruit, in order to secure the destruction of all larvæ which may be contained therein. Should adult flies be found amongst the trees, set kerosene traps. Another very good method of trapping adult flies is to hang strips of "Tanglefoot" on the trees.

Codlin Moth

The orchard should be kept free of any rubbish which will harbour the codlin moth. It is most important that all fallen fruit should be picked up and destroyed regularly. Continue spraying with arsenate of lead.

Broken branches and crotches should be examined for larvæ and pupæ of the moth. A great number of these shelter under the bark on the main stem. In conjunction with spraying, bandages placed around the stem, if examined regularly, are excellent in controlling the moth.

Scale Insects on Citrus Trees.

Red and other scales of the citrus trees should receive attention. These may either be sprayed or fumigated in accordance with directions given in published tables, copies of which may be obtained by applying to the Department of Agriculture.

Miscible oils are largely being used by growers for the control of scale insects. Care should be taken to only use oil washes that emulsify in a thorough manner. Trees out of condition and weak must not be sprayed until after a good fall of rain. Before spraying, a light thinning and cutting away of dead wood would be an advantage. Do not spray on very hot and windy days. The early morning and evening are the most suitable times.

Disbudding.

See that all superfluous growth is removed from the roots and trunks of all trees and vines, so that the new growth will be confined to the development of limbs and canes which have been selected to form the main arms and branches of such tree or vine. It is regrettable to see suckers growing from the roots of many trees and vines which could, with a very little trouble, have been removed, the strength of the plants being thus directed toward the development of the tops.

Summer Thinning.

This may be started this month, and it is well to go over and regulate the growth of all young trees, thinning and shortening back where required—that is where the tree is growing too thick ; and pruning or pinching back so as to keep the tree evenly balanced and symmetrical. This early summer work is more for young trees, to aid in directing the growth to that part of the tree where it is most required.

Pruning.

Pruning of citrus trees may be continued wherever it is not completed. The pruning and manuring of passion fruit vines may be carried out during the early part of this month.

Thinning Fruit.

In nearly every orchard trees are to be found which are apt to overbear, or which carry heavy crops every alternate year, while during the off year they

set very little fruit. How much better would it be, therefore, if we would use every means to regulate the cropping? To this end thinning should be done as soon as possible after the pits harden in stone fruits. This very important work should receive more attention in the future than has been given in the past.

Harvesting.

The harvesting of the orange and lemon crop will be about completed this month, and that of early apricots, peaches, and cherries will commence. See that all are well graded, and put up in the most attractive manner. Neither apricots nor peaches should be allowed to become over-ripe before being marketed. As a matter of fact, they should be picked on the green side, as it is usually a few days after they leave the orchard before they reach the consumer, by which time they are in about right condition for use.

Grafts.

These will have to be regularly attended to now. Keep them well disbudded, removing all shoots and buds below the graft.

Lemon Picking.

At the Government Orchard, Dural, lemons are clipped regularly every month or five weeks, and stored in the packing house in paper-lined fruit cases until they sweat. The skin toughens, and the fruit ripens into a beautiful light straw colour. There is a slight shrinkage in bulk, and a few specimens rot. The prices received are very good; the fruit is wrapped for market, and, in the opinion of the agent, is comparable with the best Italian and Californian product.

Fumigation.

Fumigation has proved to be one of the best means for treating scale insects affecting citrus trees. Although the initial cost for tents is a large item, and was for some time a bar to the general practice of fumigation, the results achieved have resulted in its more general use.

Fumigation is best conducted during the autumn months. It does not require much skill to carry on the work, although care is necessary to secure good results. The Departmental Miscellaneous Publication, No. 1,615, deals in a general manner with fumigation, and should be consulted for detailed information. Although scale insects are mainly dealt with, white louse is a pest that can be controlled by fumigation. This pest is becoming more pronounced in stone and citrus fruit centres. Mr. R. E. Peck, of Comleroy Road, near Richmond, who has had some years' experience in fumigation, has had excellent results in the control of white louse. A reference to the illustrations showing treated and untreated trees will serve to show the results that may be obtained with fumigation for this pest when conducted in a thorough manner.

Fig. 1.—Fruit from tree fumigated twelve months ago. The trees are perfectly clean, and carrying as much as 5 bushels of choice fruit.

FUMIGATION FOR WHITE LOUSE.

Fig. 2.—Fruit from an untreated tree grown under the same conditions as No 1, but not fumigated It was only six rows from treated trees The tree is only carrying one case of fruit, most of which is deformed and unfit for market.

FUMIGATION FOR WHITE LOUSE

Government Stud Bulls available for service at State Farms, or for lease.

Breed.	Name of Bull.	Sire.	Dam.	Stationed at—	Engaged up till
Shorthorn ...	Melba's Emblem (Vol. IV. M.S.H.B.)	Emblem of Darbalara (100 M.S.H.B.)	Melba 3rd of Darbalara (1058 M.S.H.B.)	Berry Farm ...	‖
" ...	Imperialist ... (183 M.S.H.B.)	Florio	Lady Nancy of Minembah.	Berry Farm ...	*
Jersey ...	Grenadin (imp.)	Attorney (9477)	Cyril's Carnation (imp.).	H. A. College ...	*
" ...	Trafalgar ...	Best Man ...	Rum Omelette	Cowra Farm ...	*
" ...	Kaid of Khartoum	Sir Jack ...	Egyptian Belle	Yanco Farm ...	*
" ...	Leda's Retford Pride.	Dinah's Lad ...	Leda's Angel..	Wagga Farm ...	‖
" ...	Goddington Noble XV (imp.)	Goddington Noble	La Franchise 3rd.	" ...	*
" ...	Xmas Fox (imp.)	Silver Fox ...	Malvoisie ...	H. A. College ...	‖
" ...	Janet's Queen IV Brighton of Coolangatta.	Brighton King of Coolangatta.	Janet Queen IV of Coolangatta.	" ...	*
Guernsey ...	The King's Mirror	Calm Prince ...	Vivid (imp.)...	Wollongbar Farm	*
" ...	Godolphin Moses (imp.)	Golden Hero of the Vauxbelets (1929)	Rosetta (6509)	Wollongbar Farm	*
" ...	Hayes' Fido (imp.).	Hayes' Coronation 3rd.	Hayes' Fi-Fi 2nd.	Wollongbar ...	30 Dec., '15.
" ...	Claudius (imp.)	Golden Star II..	Claudia's Pride (imp.).	Murwillumbah ...	30 Dec., '15
" ...	George III ...	King of the Roses	Calm 2nd ...	Wollongbar Farm	‖
" ...	The Peacemaker	Calm Prince ...	Rose Petersen	Wollongbar Farm	‖
" ...	King of the Roses	Hayes' King ...	Rosey 8th (imp.).	South Kyogle ...	30 Jan., '16.
" ...	Lauderlad ...	Laura's Boy ...	Souvenir of Wollongbar	Fairy Hill ...	— April, '16.
" ...	Belfast	King of the Roses	Flaxy 2nd ...	Tyalgum	29 Nov., '15.
" ...	Royal Preel ...	Itchen Royal ...	Hayes' Lily du Preel (imp.).	Murwillumbah ...	30 Mch., '16.
" ...	Alexander the Great.	Claudius (imp.)	Alexandrina of Richmond.	Bowraville ...	28 Mch., '16.
Ayrshire ...	Wyllieland Bright Lad (imp.)	Wyllieland Gleniffer (7229)	Wyllieland Sangie	Glen Innes Farm..	*
" ...	Isabel's Majestic	Majestic of Oakbank.	Isabel of Gleneira.	Grafton Farm ...	‖
Holstein ...	Sultan La Polka (imp. N.Z.)	King of Dominos (297 N.Z.H. & F.H.B.)	Princess La Polka (292 N.Z.H. and F.H.B.)	Berry Farm ...	*
Kerry... ...	Castle Lough Ranger (imp.)	Waterville Rover	Castle Lough Lizzie.	Bathurst Farm ...	*

*Available for service only at the Farm where stationed. † Available for lease or for service at the Farm where stationed.
‖ Available for special service where stationed upon application to the Under Secretary.

BULLS FOR SALE

AT BERRY EXPERIMENT FARM.

JERSEY—Wagga Commander (319): born 10th June, 1914; colour, whole fawn; sire, Aitua's Lad; dam, Wagga Clover (781 A.J.H.B.); Aitua's Lad, by Kaid of Khartoum, from Wagga Aitua (787); Kaid of Khartoum, by Sir Jack from Egyptian Belle (382); by Tidy Punch from Egyptian Princess (imp.) (65 A.J.H.B.). Price, 12 **guineas.**

SHORTHORN—Go-Hon: born 10th February, 1915; colour, red; sire, Come-back, of Darbalara; dam, Ruby VII, of Darbalara (passed Vol. IV, M.S.H.B.), by Emblem, of Darbalara, from Ruby, of Bolaro, by Shoalhaven. Price, 20 **guineas.**

HOLSTEIN.—Marshal Oyama: born 7th August, 1914; colour, black and white; sire, Field Marshal; dam, Miss Muller, by Hollander, from Margosa; by Garfield (imp.), from Maggy Obbe; by Obbe (imp.), from Margaretha (imp.). Price, 18 **guineas.**

Milk yield :—	Milk lb.	Fat per cent.	Butter lb.
Miss Muller, 273 days	8,700	3·37	334·29
Margosa, 213 days...	5,946	3·07	207·18
Maggy Obbe	7,699	—	271·75
Margaretha (imp.)	10,990	—	407

Field Artillery: born 14th August, 1914; colour, black and white; sire, Field Marshal; dam, Bercham, by Obbe II, from Lolkje Zuyder Zee; by President, from Lolkje Veeman (imp.). Field Marshal is by De Wet, from Lolkje Field; by Garfield (imp.), from Lolkje; by Joubert, from Lolkje Veeman (imp.). Price, **18 guineas.**

Milk yield :—	Milk lb.	Fat per cent.	Butter lb.
Bercham, 273 days	8,836	3·31	334
Lolkje Veeman (imp.)	11,996	—	479

AT GRAFTON EXPERIMENT FARM.

AYRSHIRE.—No. 42: born 27th March, 1914; colour, white and brown; sire, Jamie's Heir, by Jamie of Oakbank; dam, Belladonna of Russley, by Duke King of Ardgowan (imp.) from Belides; by Victor of Munnoch (imp.) from Bella (64 A.A.H.B.), by Gladstone from Beauty IV, by Cicero from Beauty III, by Nimrod from Beauty II, by Dunlop from Beauty (imp.). Price, **12 guineas.**

GUERNSEY COWS FOR SALE BY AUCTION

At the LISMORE SHOW, Nov. 24, 1915.

Shamrock of Illawarra (182 A.G.H.B.); born 13th February, 1908; colour, orange and white; sire, Jap 1 (1785 P.S.R.G.A.S.); dam, Shamrock of les Vesquesses VI (imp.) (6829 P.S.R.G.A.S.).
Served by Peacemaker, 12th April, 1915.

Sweetheart (188 A.G.H.B.); born 7th January, 1909; colour, lemon, fawn, and white; sire, The Admiral; dam, Souvenir of Wollongbar, by Vivid's Prince from Souvenir (imp.); by Socialist (586 E.G.H.B.) from Necklace (2526 E.G.H.B.).
Served by Peacemaker, 3rd June, 1915.

Darling of Wollongbar (38 A.G.H.B.); born 15th March, 1911; colour, dark fawn and white; sire, Royal Preel, of Wollongbar (imp.); dam, Sweetheart (188) by The Admiral, from Souvenir, of Wollongbar; by Vivid's Prince from Souvenir (imp.).
Not served yet.

Angelica of Berry (5 A.G.H.B.); born 12th January, 1912; colour, orange and white; sire, Claudius (imp.); dam, Angelica VIII (imp.) (5630 P.S.R.G.A.S.), by Captain Powell (1430 P.S.R.G.A.S) from Angelica (749 P.S.R.G.A.S.).
Not served yet.

Flaxy IV (54 A.G.H.B); born 16th August, 1912; colour, lemon and white; sire, Rosehill (imp.) (2218 E.G.H.B.); dam, Flaxy III, by Lord Clatford (imp.) from Flaxy II; by Rose Prince (imp.) from Flaxy (imp.).
Not served yet.

Constance (33 A.G.H.B.); born 26th April, 1912; colour, lemon and white; sire, Hayes' Fido (imp.); dam, Faith, by Prince Souvia from Miss Clatford of Wollongbar (imp.), by Clatford Hope II (1814 E.G.H.B.) from Clatford Hopeful (imp.).
Served by George III.

Golden May of Wollongbar (74 A.G.H.B.); born 4th September, 1912; colour, orange and white; sire, Hayes' Fido (imp.); dam, Miss Golden of Wollongbar, by Golden Star II (1751 E.G.H.B.) from Bijou de la Fontaine III (imp.).

Cato of Wollongbar: born 26th December, 1912; colour, orange and white; sire, Hayes' Fido (imp.); dam, Token, by Peter (imp.) from Souvenir (imp.), by Socialist (586 E.G.H.B.) from Necklace (2526 E.G.H.B.).
Served by Peacemaker.

GEORGE VALDER,
Under Secretary and Director of Agriculture

AGRICULTURAL SOCIETIES' SHOWS.

SECRETARIES are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 21st of the month previous to issue Alteration of dates should be notified at once.

1915.

Society.	Secretary.	Date.
Mullumbimby A. Society	W. A. Davis	Nov. 17, 18
Lismore A. and I. Society	T. M. Hewitt	" 24, 25, 26

1916.

Society.	Secretary.	Date.
Wollongong A., H., and I. Association	W. J. Cochrane	Jan. 14, 15
Kiama Agricultural Society	G. A. Somerville	" 26, 27
Newcastle A., H., and I. Association	E. J. Dann	Feb. 16, 17, 18, 19
Inverell P. and A. Association	J. McIlveen	" 22, 23, 24
Dapto A. and H. Society	J. J. Cook	" 22, 23
Southern New England P. and A. Association (Uralla)	H. W. Vincent	" 29, Mar. 1
Braidwood P., A., and H. Association	L. C. Chapman	Mar. 1, 2
Gunning P., A., and I. Society	J. R. Turney	" 1, 2
Berrima District A., H., and I. Society	C. E. Wynne	" 2, 3, 4
Queanbeyan P. and A. Association	J. G. Harris	" 7, 8
Tenterfield P., A., and M. Society	F. W. Hoskin	" 7, 8, 9
Crookwell A., P., and H. Society	M. P. Levy	" 9, 10
Nepean District A., H., and I. Society	P. J. Smith	" 10, 11
Bangalow A. and I. Society	W. H. Reading	" 14, 15
Central New England P. & A. Association (Glen Innes)	G. A. Priest	" 14, 15, 16
Cobargo A., P., and H. Society	T. F. Kennelly	" 15, 16
Coramba District P., A., and H. Association	H. E. Hindmarsh	" 15, 16
Manning River A. and H. Association	L. Plummer	" 15, 16
Gundagai P. and A. Society	A. Elworthy	" 15, 16
Walcha P. and A. Association	J. N. Campbell	" 15, 16
Camden A., H., and I. Society	A. E. Baldock	" 15, 16, 17
Macleay A., H., and I. Association (Kempsey)	E. Weeks	" 15, 16, 17
Armidale and New England P., A., and H. Assoc'n.	A. McArthur	" 21, 22, 23, 24
Mudgee A., P., H., and I. Association	P. J. Griffin	" 21, 22, 23
Molong P. and A. Association	W. J. Windred	" 22
Crookwell A., P., and H. Society	M. P. Levy	" 23, 24
Moruya A. and P. Society	H. P. Jeffery	" 24, 25
Warialda P. and A. Association	C. O'C. Murray	" 28, 29, 30
Orange A. and P. Association	W. J. I. Nancarrow	April 4, 5, 6
Quirindi District P., A., and H. Association	C. G. Brandis	" 4, 5, 6
Clarence P. and A. Society (Grafton)	G. N. Small	" 5, 6, 7
Cooma P. and A. Association	C. J. Walmsley	" 12, 13
Bathurst A., H., and P. Association	S. V. Turrell	" 12, 13, 14
Upper Hunter P. and A. Association (Muswellbrook)	R. C. Sawkins	" 12, 13, 14
Richmond River A., H., and P. Society (Casino)	D. S. Rayner	May 3, 4
Dungog A. and H. Association	C. E. Grant	" 10, 11
Kyogle P., A., and H. Society	R. J. Nethery	" 10, 11
Murrumbidgee P. and A. Association (Wagga)	A. T. D. White	Aug. 22, 23, 24
Holbrook P., A., and H. Society	J. S. Stewart	Sept. 20, 21
Narandera P. and A. Association	H. Robinson	" 27, 28

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Wheat-breeding in New South Wales.

[Continued from page 741.]

J. T. PRIDHAM, Plant Breeder.

Selection.

THIS is sometimes understood to mean the use of graded seed or plump well-developed instead of pinched seed. While it is desirable to sow grain of this description it is far more important that it should be the produce of high-yielding plants. Grading does not go far enough, because medium and light-yielding plants may produce large heavy seed; and, indeed, this is often the case, from the fact that such plants have fewer stalks or smaller heads than the average to provide for. Selection is practised in two ways:—

(1) Mass selection;
(2) Individual selection.

Mass selection consists in collecting a large number of heads, typical of the variety, and mixing their grain together. This method has been used successfully by Professor Zavitz, of Canada. Advocates of individual selection, however, take the individual plant or a single ear as the unit for propagation. This plan is most largely followed by breeders, and is employed by us exclusively. Some prefer to use single ears only in their first selections, but Vilmorin, of Paris, has found that there is great uniformity seen in the produce of different ears from the same plant, though individual plants differ from each other as to their transmission of characters. In our work we make use of the seed from the whole plant instead of isolating special ears.

Material for Selection.

The results of continued selection of the most productive and desirable individuals will depend upon whether the material is a "mixed population," or a "pure line." The former condition is found in the case of all farmers' crops, which have not been subjected to a course of selection, and a rich field is here afforded for improvement. Even if there be no admixture of varieties a large number of strains or pure lines will be present, some of which are quite unproductive. This inherent variation in plants is no doubt a provision of nature to meet the changes in the seasons as well as diversities of soil, so that some of the plants will give a maximum yield, however the season turns out, although the average yield of the crop may be only very moderate.

No Cumulative Effect in Selection.

When a pure line has been isolated continued selection temporarily increases the yield, but the tendency is constantly towards mediocrity, and the stock of seed degenerates if methods of selection are not maintained. It

had been held that there is a cumulative effect after a course of years with such methods, but we have not noted any such result in our standard varieties of wheat. "The culture of pure line selections of six varieties of wheat showed no permanent change in point of yield, height of plant, and length of upper internode during thirteen years of breeding at the Minnesota Station."* Again, specimens collected by Vilmorin, of Paris, which were in cultivation fifty years ago, were discovered recently, and compared with ears harvested from the same varieties of wheat in 1908–10. It was seen that they were identical in all respects, and when grown they were found to ripen at the same time. Although no permanent improvement is possible with pedigree culture, it enables a high-yielding standard to be maintained, and the purity of the variety ensured by the removal of stray plants, sports, or natural crossbreds which occur from time to time.

Adaptation.

A farmer sometimes selects a wheat which has a purely local adaptation, and if the variety gives consistently good results it is not wise to give it up. Continuous selection will maintain its good qualities for the district. An instance of this is Genoa wheat at Glen Innes Experiment Farm; there are very few districts where this variety gives such good results. Zealand and Cleveland, at the Wagga and Bathurst Experiment Farms respectively, have found suitable local conditions, and give the highest yields in their class from year to year. Introduced varieties, or wheats from another district, when tested alongside them are seldom equal in yield. Crossing within the variety has failed to give increased yields in the progeny where the parents used in the cross have been through a process of selection in the locality. Cleveland x Cleveland at Bathurst, and Hard Federation x Hard Federation at Cowra, yielded rather less than selected seed of their parents grown alongside. The effect of crossing seemed to disturb the adjustments of the variety to its environment.

Increased Yields due to Selection.

It is rare for local farmers' seed to beat Departmental selected seed when sown in farmers' experiment plots.

Mr. A. E. V. Richardson, Agricultural Superintendent in Victoria, obtained the following results with Federation at the Longerenong College:—

		bushels.		bushels.	
In 1912,	selected seed yielded	43·25;	unselected,	34·0	per acre.
In 1913,	„ „	36·20	„	24 6	„
In 1914,	„ „	9·77	„	5·73	„

Data received from growers of Banner oats in Canada showed an average yield of 51 bushels per acre from registered seed sent out by the Canadian Seed-growers' Association, as compared with 43·5 bushels per acre from ordinary seed, and the former was the heavier sample.† Instances could be multiplied, but these serve to show the advantage of isolating in any variety a productive strain.

* T. B. Hutcheson, Experiment Station Record, 1915. Vol. XXXII., p. 231.
† L. H. Newman, Experiment Station Record, June, 1914.

Other Advantages.

By sowing uniformly high-yielding seed we get even germination; a uniform level crop, which ripens evenly, presenting no difficulties in harvesting; the fertiliser and soil moisture are employed to the best advantage; diseases are reduced to a minimum, and the farmer, by practising selection, becomes more observant and keenly interested in his work, especially when he finds it brings him larger profits.

Aims in Selection.

These will differ in various districts, though productiveness is always the first consideration. Earliness of ripening is of great importance in dry warm districts, also where rust is prevalent, as in coastal regions. One cannot expect a plant to be very productive, and at the same time very early. The differences of local needs causes multiplication of varieties adapted to special conditions. Common-sense should indicate the bounds of selection. A plant, bearing large heads for instance, will not produce, under similar conditions, so many as one bearing normally small heads. In pedigree culture of any variety the characteristic type should be adhered to, and when selecting from an ordinary crop for desirable varieties or sports, or selecting from the progeny of an artificial crossbred, it is better to be guided by actual yield per plant than to keep a preconceived type in view. If the chosen plant is productive the shape of the ear matters little. Of course, field defects—such as shattering and weak straw—must be watched for. Artificial crossing should be undertaken with a definite object in view, and to this extent an ideal type should be in the mind when selecting.

When and How to Select.

The best time is just when the heads of the crop are changing colour from green to the ripe tints. At this stage the early ripening productive plants can readily be seen, and the farmer should go through the wheat with some narrow strips of coloured print and tie a piece under the head of any desirable plant. Then, before harvesting the crop, these marked plants should be pulled up (seeing that the roots of neighbouring plants are not included) and threshed either separately or together. Better results will follow if they are kept separate, using small seed-packets obtainable from a stationer, because some of the plants will yield better than others. It will often happen that a diseased or weak plant ripens early, but these must be avoided. Due allowance should be made if a plant is taken from a patch of rank overgrown crop; it is best to choose average growth, avoiding rich spots where the wheat has been favoured by additional fertility or moisture. By leaving the plants till they are quite ripe, any defects—such as shattering or weak straw—may be detected, and the seed grows better when allowed to ripen fully.

Sowing the Selected Seed.

The best yielders of the plants gathered should be sown thinly in separate rows, like peas, the seed from the rest of the plants being bulked together and sown with the farm seed-drill down a single spout. It is best to block one spout on either side of this with paper, so that the selected seed will show up

distinctly when the crop germinates. Next season some of the single rows will be seen to be inferior to the others, and these should be rejected. Those left for harvesting should form the selected bulk for sowing through a spout of the seed-drill. It is advisable to introduce a plant or two from time to time from the main crop, though the selected plants are now taken each year from the selected rows. By continually increasing the bulk of improved seed sown, it will in a short time be possible to sow the entire farm. The grower will find great advantages in following this method, though some will find it a little too much trouble. A younger member of the family might easily do the work, though it is worthy of the farmer's own serious attention.

Testing of Strains.

The value of a strain can only be determined accurately by growing it for several years in comparison with a standard variety. We find in our experiments that it is not sufficient to sow one plot of a new wheat; at least three should be sown of equal size, with alternate plots of the standard variety as a check. The average yield of the plots of the respective varieties will give a good idea of their productiveness. This testing is done on the Experiment Farms of the Department of Agriculture, and the approved sorts are further grown on farmers' experiment plots in districts suitable for them. It then remains for the farmer to go in for the varieties that will yield best on the average in his particular district, and to select these in the way already described. New and introduced wheats we are always ready to test and report upon as soon as the seed has been long enough under observation. Evident defects sometimes condemn them the first season.

Prepotency.

It is not enough to know that an individual plant taken from a crop yielded well—we must know its power of reproducing itself. If it produces a good yield per row of a given length or per plot of a given size for several seasons, in comparison with other strains tested in the same way, we may conclude that it is the mother of a productive strain. The breeder should, as a rule, reject heavy-yielding plants in plots of low average yield, as those exceptional plants probably owe their vigour to natural crossing or to specially favourable conditions during growth. Two plants may be identical in appearance, but when their seed is sown in plots for comparison it will be found that the yield per plot will be better in the one case than in the other. Prepotency or transmitting power is of the highest importance in breeding. It is desirable to make a good many field selections; the most prepotent mother plant is not always the most attractive. This is well known to breeders of stock; the best animal to breed from is sometimes the least showy.

Law of Variability.

An illustration of the principle of selection is afforded by Quetelet's Law of Variability, which states that though the individuals of any species, race, or family resemble the average of their class in any given quality, there are a few which excel and a few which are considerably below the average in that quality. The fact that the average height of the men of the French nation is rather below that of the British has been attributed to the effect of

the destructive wars of Napoleon. The tallest men were taken for service in his armies, and their loss had an appreciable effect on the nation as a whole. Let a thousand men be taken at random and ranged in line according to their height, the tallest being at one end and the others in descending order to the other end. It will be found that there are comparatively few very tall men, also a small proportion of very stout individuals, and the rest are of medium height—the man in the middle representing the average. We may apply this illustration to the selection of wheat plants and say that there are just a few very high yielders, a few very poor, and the rest moderately productive. Unless steps are taken to save seed only from the heavy yielders, the grower will never reap the best returns for his labour, because his seed will be of only average producing power. No matter how rich the soil, favourable the season, thorough the fallowing and cultivation, and adequate the fertiliser, one cannot obtain a maximum crop without a highly productive strain of seed. It is conceivable that before long we shall have farmers engaged in pedigree seed-growing, just as we now have breeders who devote their attention to the upkeep of pedigree live-stock.

Conclusion.

In the American Breeders' Association Year-book for 1907, the Committee on Cereal Breeding gives the following summary, which may well be quoted here:—"Varieties are made up of numerous strains. Some of these are permanent variations, mutants, either better or poorer than the average of the variety. Some of the strains are fluctuating variations. Individuals have been found to give rise to pure strains. Variety improvement by selection is to be obtained by the selection of individual favourable mutants. These may be of all degrees of favourableness. The best are to be determined by comparison of the progeny, usually for more than one generation. Individual strains must be kept pure and distinct. The favourable permanent varieties are sufficiently numerous to supply most needs for improvement: c.f. work done at Svalöf, Minnesota, and Nebraska."

Professor W. M. Hays, Assistant Secretary of Agriculture in the United States of America, said in 1911:—

"That the five or six billion dollars worth of plant and animal products annually grown in the United States of America can be increased 10 per cent. by selection and breeding is not seriously doubted by those able to judge. The addition of ten billion dollars worth of products every twenty years by readjusting the hereditary tendencies of our crops and animals at a merely nominal cost is as important as the development of electrical methods and appliances or as the perfection of a system of railways and public roads, or as our entire foreign commerce. . . .

"It is certainly a good business proposition to develop breeding projects rapidly and freely. The evidence shows that this proposition is every year developing into a form that cannot be ignored. Our country is destined to see breeding projects developed, as it has seen mechanical projects grow. Our plant and animal forces are fully as potent economic factors as our mechanical forces, and are worthy of as serious efforts to develop them."

Notes on Some Recently Imported Wheats.

F. B. GUTHRIE and G. W. NORRIS.

THE following notes on the milling quality of some of the principal wheats recently imported may be of interest at the present time. The importation of wheat was necessitated by the failure of the local harvest, and the results are instructive as an indication of the kind of grain at our disposal in the case of local shortage. The last occasion on which it was necessary to eke out our supplies by importation was in 1903. At that time a large quantity of grain was obtainable from Manitoba. The high value of this grain to the millers had been demonstrated on a previous occasion (in 1895-96), when a similar failure of the local wheat harvest necessitated importation from Canada and the United States. This misfortune was not an unmixed calamity as far as the improvement in Australian wheat was concerned, for it introduced to our millers a grain of higher milling excellence than that which they had hitherto been accustomed to handle. It enabled our wheat breeders to study the characteristics of this improved type of grain, and to improve local wheats along definite lines in order to produce a similar improved type suitable to local conditions of soil and climate. Many, indeed most, of the best milling wheats we now possess are crossbreds, one or more of whose progenitors were Manitoba or Fife grain. The result of this, as we have pointed out elsewhere, has been a steady and consistent advance in the quality of our grain—an advance which is becoming more marked with every year, and which reflects itself in the improvement noticeable in the f.a.q. sample.

On the present occasion no such benefit has resulted. Instead of having introduced to us better quality wheats, the fact is driven home to us that if we are compelled to import wheats, we are obliged to fall back upon grain of very inferior quality. In some cases it is almost impossible to obtain a decent flour, far less a presentable loaf.

The wheats examined (with two exceptions) were taken from bulk supplies imported by the State, the exceptions being a wheat imported from Japan, and a Red Fife from Oregon, which were imported by local firms. The remainder are shipments of Argentine wheats.

The samples are for the most part of poor appearance, and more or less pinched. They are very uneven, and contain a disproportionate amount of dirt and foreign seeds, including bunt in many cases. It was not possible to obtain from any of them, even after grading and cleaning, flour anywhere approaching the Sydney standard in colour, strength, or gluten content. Russo-Barletta and Baril appear to be the most satisfactory milling wheats

of the batch. The White Walla was the most uniform in size, and there appears to have been some attempt at grading. In the other cases there was no attempt at grading and cleaning, and samples taken from different bags differed so much from each other in appearance as to be taken for different wheats.

It is a matter of some congratulation to ourselves to have this practical demonstration of the improvement that has been effected of recent years in our local wheats. This improvement is indicated by the fact that, whereas on previous occasions the imported grain has been of better quality than our own, we find that to-day if we are forced to import, we can only obtain grain which is very inferior in quality to that which we produce. If we are obliged on future occasions to import grain from abroad we must be prepared to accept a lower standard for flour and bread than that to which we have become accustomed. There follows more detailed descriptions of the different wheats examined.

Russo-Barletta.

Russo-Barletta (imported from Argentine), was a small, long, dark-red grain of poor appearance, being pinched and dirty, containing a considerable admixture of foreign seed. Five per cent. was removed on cleaning. Weight per bushel, 62 lb. On milling it proved to be fair to mill, yielding 70 per cent. flour, 13·1 pollard, and 16·9 bran. The flour was of fairly good colour and texture, but not first-class, being speckled. Bran was small and fairly clean. Pollard clean. The flour strength was 45 quarts per 200 lb. sack. Gluten content, 11·4. The gluten was faint yellow, elastic, soft, coherent. On baking, a loaf of good volume was obtained. but inferior to that made from local wheats. Assuming a loss of 1-9th on baking, a 200 lb. sack of flour should produce 275 lb. bread, the 1 lb. loaf having a volume of 1,637 cubic centimetres, which is good.

A further sample from another shipment of this wheat (by the s.s. "Elvaston") was a very mixed sample—long thin grain, dark-red in colour, and pinched. The bushel-weight was 60·7 lb. The sample was not of attractive appearance, containing a large amount of foreign seed, but it nevertheless produces a very satisfactory flour. It is the strongest of the imported wheats so far examined, its water-absorbing power being 47; but this strength is considerably below what we have been accustomed to in our local flour. The gluten is high (12·2 per cent.), soft, slightly yellow, elastic.

On baking it produces a very satisfactory loaf, being of good volume and appearance, with even texture; a 1 lb. loaf has a volume of 1,448 cubic centimetres, which is very satisfactory.

A third sample of Russo-Barletta, taken from the sailing vessel "Eudora," was very similar to the others in appearance, being a very mixed, long, thin, dark-red, pinched grain. This was a particularly dirty sample; and the appearance of the sample was much impaired by the large amount of rubbish present. The sample contained bunt, and was very uneven. The flour produced is satisfactory, though not up to that from the "Elvaston." The flour

strength is low—43 quarts per sack, gluten content 10·4 per cent., and colour fair. On baking it gives a loaf of good volume and appearance, the 1 lb. loaf having a volume of 1,405 cubic centimetres, which is quite satisfactory.

Red Fife.

This sample was imported by one of the local mills from Oregon. It was a very poor, pinched, dirty sample. In appearance the grain is dull red in colour, long, thin, fairly hard. The sample was pinched. It is an inferior milling sample, yielding: Flour, 68·2 per cent.; pollard, 16·5, and bran, 15·3. The colour of the flour is low. Flour strength, 42 quarts per sack, and gluten content, 8·5. The gluten is dark coloured, soft, and non-elastic. The flour is of poor quality, being low in colour, gluten content, and strength.

A second sample of the Red Fife was obtained per s.s. "Asama Maru."

This was a mixed sample, red and brown grains, fairly plump, and of medium size and hardness; bunty.

The sample is amongst the best in appearance of the imported grains, but the flour produced is very poor in quality. The bushel-weight is 62 lb. The bran is rather hard to clean, as the flour has a tendency to cling to it. The water-absorbing power of the flour is very low (42·4 quarts per sack), and the gluten, though fair in quantity (9·6 per cent), is of inferior quality. It produces an unsatisfactory loaf on baking, having small volume and being poor in appearance. The 1 lb. loaf has a volume of 1,041 cubic centimetres.

A third sample of Red Fife shipped by the "Margan Abbey" proved to be the most satisfactory specimen of this variety. The grain was similar in appearance to that shipped in the "Asama Maru," being mottled (red and brown), fairly plump, of medium size and hardness. Bushel weight, 62½ lb. The flour is richer in gluten than the other samples, of better colour, and of better water-absorbing power. The loaf was of good quality, well caramelized, nicely shaped, and of good volume and texture. The 1 lb. loaf measured 1,377 cubic centimetres, being one-third bigger than the "Asama Maru" sample.

Unnamed. (Imported from Japan.)

This is a small, dull red, plump, soft, shotty grain. The whole of the sample passes through at 2·5 millimetre mesh. Its bushel weight, owing to the round shape of the grain, is fairly high, going 63 lb. to the bushel, but in all other respects it is a very inferior milling wheat. It yields 70 per cent. flour, 14·3 per cent. pollard, and 15·7 per cent. bran. The flour is very low in colour, and speckled in appearance. The flour strength—41·6 quarts per sack—is exceedingly low, as is the gluten figure—9·6 per cent. The gluten is soft, grey in colour, and non-elastic. It is almost impossible to bake a good loaf of bread from flour of this wheat. The sample was imported by a Sydney firm.

White Walla.

This wheat was imported from Argentine in the s.s. "Colusa," and is to be distinguished from the "Red Walla." It is a small, round, amber-coloured grain, soft and plump, and very uniform in size, nearly the whole

of the sample passing through a 2·75 millimetre sieve. The bushel weight is 64 lb. It is an easy grain to mill, yielding 70·5 per cent. flour, 12·2 pollard, and 17·3 per cent. bran. The colour of the flour is good, but not up to the standard of the first-grade local flour. The flour strength is 42 quarts per sack, and the gluten content, 8·3 per cent. The gluten is soft, of a slight yellow colour, elastic, and coherent. It bakes well, giving a loaf of good appearance and volume. A 1 lb. loaf has a volume of 1,426 cubic centimetres.

A second sample of White Walla was of similar appearance and characteristics, but produced an inferior loaf. The grain is of a light amber colour, soft, plump, of medium size, and hump-backed; bushel weight, 62·8 lb. The appearance of the sample was good, being fairly uniform in size and fairly free from foreign matter.

Its behaviour in the mill is similar to that of the previous sample, but it produces an inferior loaf, of poor appearance and smaller volume. The 1 lb. loaf occupies 1,250 cubic centimetres.

Red Walla.

This, like White Walla, comes from Argentine. It is small, round, light-red grain, plump and fairly even, hump-backed.

It is a wheat of fine appearance and high bushel-weight—the sample examined going 66 lb. to the bushel. It is, however, disappointing in the mill. The sample was fairly even and free from rubbish.

It yields its flour readily. Like the White Walla it is a weak-flour wheat, giving a flour of rather low water-absorbing power (44 quarts per sack) and fairly rich in gluten (10·9 per cent.) The colour and texture of the flour are good, but not first-class. It is generally very similar to White Walla, though somewhat richer in gluten and of better water-absorbing power.

Blue Stem.

This was imported from Argentine, and has a grain of a light amber colour, plump and soft, and of medium size, up to 3 millimetres. Bushel weight, 62½ lb. The grain is easy to mill, giving 69·4 per cent. flour, 12·9 pollard, and 17·7 bran. Bran fairly clean, pollard clean. Semolina, white and soft. It is a poor miller's wheat, yielding flour of only poor quality. The colour of the flour is inclined to be chalky. The flour strength is 43 quarts per sack, and gluten content 8·4 per cent. The gluten is faintly yellow, soft, fairly elastic, and coherent. In volume the loaf produced was not so good as that obtained from Walla, a 1 lb. loaf having a volume of 1,329 cubic centimetres. In appearance both loaves are similar, that from Walla being rather the better of the two.

A second sample under this designation was examined. It is a pale amber-coloured grain, mixed with a small percentage of red grain. Grain is of medium size; it contains bunt, but is otherwise fairly clean and free from rubbish. The bushel-weight is 63·1 lb., and the grain easy to mill. The flour

is richer in gluten than the previous sample (10·1 per cent.), but is a weak flour (water-absorption, 44 quarts per sack), and, like the other, yields a not very satisfactory loaf, the bread being close and heavy and the volume rather small; the 1 lb. loaf has a volume of 1,229 cubic centimetres.

In general behaviour Blue Stem is similar to the Walla wheats.

Baril.

A sample of Baril from Argentine, *ex* sailing vessel "Songdal," was a mixed grain, light-brown and dull in colour, long and thin. The sample was bunty; bushel-weight, 61·8 lb.

This is a good milling wheat, and is similar in its behaviour to Russo-Barletta. The colour of the flour is good, water-absorption fair (45 quarts per sack), and moderately high in gluten of fairly good quality (10 per cent.) The gluten is yellow in colour, coherent and elastic. It produced a satisfactory loaf on baking, with a volume for the 1 lb. loaf of 1,442 cubic centimetres.

This and Russo Barletta are the most satisfactory milling samples among the recent importations.

Radiumising the Soil.

For some little time past the question of applying radio-active ores to the soil, with a view to increasing plant production, has been receiving considerable attention in England. Among the experimenters in this direction is Mr. Martin H. F. Sutton, of Reading, who, last year, carried out a series of tests. These have been continued during the current year, and in September last a large party of scientists and others inspected the results of the second year's work. The visitors were impressed with the complete character of the investigation, and the provision made against error. The results examined were even more emphatic than those of 1914, in showing "that while in some cases plants dressed with radio-active ore had given better results than the control plants, the improvement had not been of such a nature as to warrant the assumption that so expensive a commodity as radium could be profitably applied to crops."

A series of field trials was also conducted at the University of Illinois during the seasons 1913–14 with the object of testing the effects of radio-active fertilisers as crop stimulants. The conclusion arrived at was that as long as the present prices prevail the use of radium fertilisers cannot prove an economic possibility.

Some Factors Influencing Yield in Maize.

H. WENHOLZ, B.Sc., (Agr.), Assistant Plant Breeder.

THE purpose of this article is to set forth some of the causes which influence yield in maize which have come under the writer's observation, and to indicate, as far as possible, the means whereby unfavourable causes may be removed.

Rainfall.

This is perhaps the limiting factor, and one over which we have not usually much control. In a general way, the yield will vary almost directly with the amount which falls during the growth of the crop, but of course the distribution and incidence of the falls play a large part in determining the yield. Now the only control we have over this factor is in those districts where the planting period extends over many months, and where a certain part of the year regularly has a larger average rainfall than another. For instance, from the Central to the North Coast of this State we have what are known as the late summer and early autumn monsoonal rains, which are fairly constant—as constant, on the average, as the relatively dry spring and early summer by comparison.

Here is a factor which does not appear to be made as much use of as it might be. The accompanying table (kindly supplied by the Meteorological Bureau) shows the average monthly rainfall at several stations in maize-growing districts from the Central to the North Coast :—

Locality.	Years recorded.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total.
		ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.
Windsor	51	2·97	3·38	3·59	2·54	2·88	2·81	2·44	1·56	1·86	2·01	2·28	2·39	30·71
Wyong	28	4·18	4·10	5·96	4·32	4·32	4·68	4·50	3·11	2·97	2·59	3·03	3·87	47·69
Maitland	47	3·34	3·44	4·08	2·75	2·65	2·60	2·89	2·29	2·64	2·30	2·36	2·91	34·25
Paterson	11	2·96	4·60	5·34	4·05	2·61	2·61	4·79	2·04	3·44	3·02	2·32	3·74	41.52
Dungog	16	2·61	3·55	3·55	3·21	2·61	2·78	3·73	3·23	2·90	2·66	2·45	3·48	36 76
Gloucester	26	3·93	4 15	5·32	2·99	2·53	2·77	2·70	2·63	2·42	2·87	3·39	4·60	40·30
Taree	31	4·31	6·07	5·41	4·05	3·33	3·41	3·43	3·00	2·47	2·75	3·04	4·58	45·85
*Camden Haven	30	5·57	6·77	6·83	5·03	4·87	4·32	4·42	4·19	3·94	3 08	3 94	5·11	58 27
Kempsey	32	4·60	5·48	5·66	3·64	3·47	3·78	3·01	3·09	2·54	3·08	3 11	4·18	45·64
Macksville	8	4·41	6·89	5·83	3·12	3·54	2·97	3·02	3·31	3·26	2·51	3·56	2·17	44·59
†Belliger Heads	15	4·96	5·67	7·25	5·20	4·28	4·40	3·20	2·35	2·52	4·32	3·88	4·34	52·97
Grafton	20	4·51	4·16	4·30	2·51	2·25	2·26	2·36	1·57	1·79	2·37	2·90	4·10	35·08
Coraki	8	4·21	7·43	8·61	3·68	3·56	4·21	2·49	3·36	2·04	2 96	2·97	3·79	49·36
Murwillumbah	21	10·41	10·02	10·99	5·38	5·14	4·68	3·45	2·84	2·91	3·90	3·90	5·01	68·63

* Wauchope not available, Camden Haven substituted.

† Belligen not available, Bellinger Heads substituted.

From this table it will be seen that the average rainfall during the growing season in these localities is invariably greater for a late planting than for an early planting.

The averages are given below for comparison. They represent the average rainfall for the six months following planting:—

Locality.	September Planting.	December Planting.
	inches.	inches.
Windsor	14·89	17·75
Wyong	20·80	25·81
Maitland	16·99	19·17
Paterson	20·08	23·30
Dungog	17·65	18·24
Gloucester	21·36	23·52
Taree	23·22	27·75
Camden Haven	28·41	34·18
Kempsey	22·99	27·03
Macksville	22·80	25·96
Bellinger Heads	25·69	32·30
Grafton	19·83	21·83
Coraki	23·45	31·33
Murwillumbah	36·15	46·95

These figures practically speak for themselves, but there is another point to be considered which also favours late planting.

It is well known that there is a critical stage in the growth of maize called the "cobbing stage," during which absence of sufficient moisture has a marked effect on yield. It has been determined by considerable observation and by statistics that the yield of a maize crop is almost directly proportional to the amount of rain received by the crop for the three or four weeks following flowering, other factors, of course, being equal.

The figures given below for comparison show the average rainfall during the critical month following flowering, and, taken in conjunction with the previous figures for the total rainfall during growth, they definitely assert the superiority of late planting over early planting in the localities indicated during average years:—

Locality.	September planting.	December planting.
	inches.	inches.
Windsor	2·28	3·38
Wyong	3·03	4·16
Maitland	2·36	3·44
Paterson	2·32	4·60
Dungog	2·45	3·55
Gloucester	3 39	4·15
Taree	3·04	6·07
Camden Haven	3·94	6·77
Kempsey	3·11	5·48
Macksville	3·56	6·89
Bellinger Heads	3·88	5·67
Grafton	2·90	4·16
Coraki	2·97	7·48
Murwillumbah	3·90	10·02

It is a significant fact that many farmers on the North Coast have come to the conclusion, after many years of experience, that October is a "good month to avoid" for planting, but there is still more room for increasing the areas of December sowings beyond the present.

It has been stated by some writers on maize that a crop may be "starved for rain" during the early growth and yet yield excellently if it gets sufficient rain during the late growth. It is admitted that one of the worst things that can happen to the maize crop is for it to get plenty of rain during the early stages and a dry time during the later stages; but there is no doubt that the best crops are produced when there is a sufficiency of rain throughout the growing period, although it is preferable to have a dry period during the early half of growth than during the later half. In fact, some farmers go so far as to say it does a crop good to get a set-back during the early growth, and it may be said that this is desirable when the later growing period is unfavourable.

One of the best crops the writer saw in the season 1914–15 (an abnormal season in the incidence of the rainfall, which came on the coast in early summer instead of late), was a crop of Red Hogan (a late variety) on the flats of the Hawkesbury River at Richmond. This crop was sown on 3rd September, 1914, and the rainfall during growth was—September, 363 points; October, 595 points; November, 416 points; December, 640 points; January, 60 points; February, 215 points. Here there was ample moisture during the first four months of growth, and this carried the crop over its critical period after flowering and during cobbing; the falling off of the rainfall during the last two months would not seem to have affected the crop in the slightest. The yield of this crop exceeded 100 bushels per acre.

Other Meteorological Conditions.

Hot, blasting winds during flowering are known to have very injurious effects on fertilisation, either scorching up the pollen so that it will not germinate, or drying out the silks to such an extent that they have not sufficient moisture to germinate the pollen grains. To avoid damage by these winds, it has been found advisable in maize-growing for grain on the Murrumbidgee Irrigation Area to plant early varieties, either early in September or late in December, so that these crops do not tassel during the hotter months of the year—December to February inclusive.

When the flowering period extends regularly over some weeks, it is possible that the crop possesses an adaptability that will enable it to weather through a few days' scorching winds more successfully than if the flowering period is limited to a few days, as is the case with some varieties.

The value of sunlight is so well known that it calls for little comment. Many maize growers have recently been allowing a greater width between the rows, and many have a fancy for running the drills in a north and south direction, so that the maximum amount of sunlight reaches the plants. It is sufficient here to say that if enough sunlight does not reach the plants at the flowering stage, the size of the cobs and also their fertilisation generally suffers. This is particularly observed to be the case in a thick stand in a very cloudy season.

In those maize-growing districts where the crop has to be wedged in between late spring and early autumn frosts, it is not generally recognised that it is far better to put the sowing time forward than to delay it, for a frost has far less injurious effect on young maize than on immature maize in the cobbing stage.

Time of Planting and Period of Maturity.

It has been found by experience that where there is a choice of planting seasons, due to the long growing period between frosts, such as exists on the coast, the question of period of maturity of the variety used also enters largely into consideration. It has repeatedly been demonstrated that early-maturing varieties seldom do well if planted late. The reason for this is that a single dry spell during growth may be so prolonged as to occupy a relatively large proportion of the lifetime of an early-maturing crop, since maize planted late matures much more quickly than the same maize planted early. It is easy to understand that such a dry spell would cause more damage in an early-maturing crop than in a late-maturing crop, for the latter has more chance to recover because of its longer season. It has been observed at Grafton that a variety has matured in 110 days when planted in December, but when sown in August it took 140 days; it will readily be seen how an early-maturing crop is likely to be seriously injured by a dry spell when sown late.

Varieties.

All corn is not "merely corn." Varieties differ in maturing period, in suitability to different climatic and soil conditions, and in many other details which have a considerable effect on yield. For instance, it would be suicidal to attempt to grow a late-maturing variety on the tablelands, or a variety which revels in a wet climate and rich soil on a poor soil and in a district with scanty rainfall. It is not sufficient to draw merely a colour distinction, and say that "white corn beats yellow for yield," or *vice versâ.* Neither is it sufficient to say that "white corn yields well on poor ground." Hickory King and Boone County White are both white varieties, but while the former has a reputation for yielding well on poor ground, the latter is a maize that requires rich moist soil for its best development, and it is wholly unsuitable for poor ground where the rainfall is low.

Selection of Seed.

This is too large a subject to be treated in any detail here, and it will be reserved for a future paper. A few general principles will, however, be stated here which are not yet observed as fully as their importance demands. The value of field selection has already been treated in detail in these pages. As to the final selection with respect to the characters of the ears themselves, all that will be said just now is that there are characters as to type, &c., belonging to every variety which are correlated with yield, and observance of these in selection means maintenance or even increase of the yielding capacity.

The source of the seed should also occupy some attention. Though it is generally admitted that well grown, plump grain is the best for seed, it may sometimes happen that a breeder or grower has seed that is the result of the crossing of two superior strains of a variety which has been through a dry time, and which, though not as plump as desirable, is valuable by reason of the breeding. A stock breeder will not slaughter young stock which are of good pedigree because they are in poor condition due to unavoidable circumstances. It has not yet been shown that very plump, well grown seed yields better than a sample of smaller, perhaps pinched appearance, which has been grown on and is adapted to a particular soil, but which has had the misfortune to encounter a dry spell. Most farmers would not plant such seed on account of its poor appearance, but the "survival of the fittest" theory must not be absolutely rejected. Acclimatisation plays a large part in giving increased yields in maize in particular, and a grower would do better to keep to a strain or variety that is adapted to his own climate and soil, rather than seek fresh plump-looking seed elsewhere merely because his own has had a bad year.

The tip and butt grains are removed from the ear before shelling into the seed bag—the former because of their smaller size and the inferior plants that result; the latter because they do not give a uniform plant from the dropper and thus affect the yield.

Saving of Seed.

Rough and careless methods of saving seed lead to more disappointments in yield than, perhaps, any other cause known. Apart from the question of keeping seed free from weevils and grain moth, which seriously affect germination, due care must be taken of the seed even when these pests are known to be absent. If this is not done, a weakening of the vitality will result, which shows itself in producing inferior plants, and consequently low yields.

As the practice of saving one's own acclimatised and adapted seed is one that is to be thoroughly recommended as far superior to any system of obtaining seed from outside sources, and in consequence of the trouble and disappointment usually experienced by coastal maize-growers in keeping seed free from insect pests, the following advice as to the methods in use at Grafton Experiment Farm may be of special interest.

It is well known that early-sown crops are the most infested with weevil in the field, while later-sown crops are comparatively free. This, then, constitutes the first axiom in saving seed. Keep a small seed plot, and plant it late in the season. The next point to be observed is to select those ears of good type *in the field* which have complete and tight husk protection, and on which the weevil has not made its appearance. In case there are some weevil eggs, grubs, or adult insects, present which escape notice, and in order to kill the grub of the grain moth, which, on the North Coast at least, is present in the tip grains of nearly every ear harvested despite the husk protection, it is advisable to give the ears a fumigation with carbon bisulphide at once.

This should be done by putting the ears into an *airtight* receptacle—a bin or barrel—and placing about three teaspoonfuls of the liquid to every cubic foot of space in a shallow lid or vessel on top of the ears. The fumes sink, being heavier than air. This fumigation should take place for twenty-four hours, when the ears should be taken out, and *well-aired* to get rid of the remaining fumes. Care must be taken to have no naked light near when the bin is opened. If the ears are allowed to remain longer in the fumigating receptacle in contact with the fumes the germ will be destroyed. If the ears are dry enough, the tips and butts should be shelled off at once, as they are not required for seed, and they may contain some eggs of weevil or moth unaffected by fumigation. The ears may then be hung up in a bag to thoroughly dry out during the winter. Usually no more insects will breed out during the cold weather, but on the far North Coast a warm day will be found to have caused a few pupæ to burst their shell cases and emerge. At the first signs of spring weather, any uninjured eggs or pupæ will commence to breed out at once; and, when this is observed, a second fumigation should be given, and the ears freed from the fumes by airing as before. Some trouble might now be experienced with weevils or moths, which have bred out from other corn or refuse on the farm, and which find their way to the seed ears. To avoid this, it will be found desirable to enclose the ears—if they are thoroughly dry—in an airtight receptacle with ¼ lb. naphthalene (moth balls) for every 20 cubic feet of space. This has been found to kill any remaining insects, and will not injure the seed. If one could be certain that the ears were thoroughly dry at harvest, they could be put into such a receptacle at once with the naphthalene alone, and the trouble of fumigating with carbon bisulphide avoided, but this is not usually the case, and it is better to make sure that the ears are thoroughly dry before enclosing them for any length of time, as if the slightest excess of moisture is present, and the seed "sweats," it is rendered altogether useless.

The writer has found the above method of keeping seed to work most satisfactorily. Keeping seed thus on the cob is much easier than keeping shelled grain in quantity, the latter being difficult to fumigate properly in large bulk on account of the trouble experienced in getting the fumes to sink down into the tightly-packed grain at the bottom.

It is believed that many farmers on the coast do not practise selection of their own seed maize, chiefly on account of the difficulty they experience in keeping seed, and it is hoped that the adoption of the method here suggested will encourage them to grow and improve a maize that they have found suitable to their own requirements. The constantly recurring phrase, "suited and adapted to climatic and soil conditions," cannot be too strongly emphasised and impressed, from the point of view of yield.

Method of Planting.

The rate of planting has a considerable effect on yield, and farmers must find out for themselves the rate which gives them the best average results over a series of years under their own conditions of climate and soil as well

as the variety of maize grown. The seasonal influence on the yield from thick and thin seedings is well known: it is impossible to get good yields from thick stands in a dry season. As regards the variety, it may be generally stated that for the best yields a naturally tall-growing late maize cannot be planted as thickly as a short-stalked early variety. The rate of planting should depend, not on the size of the grain, but on the growth characteristics of the variety.

The depth of planting should only be sufficient to get the seed down to moisture, which is retained long enough to start germination. In early spring, when the evaporation is not great, and when the soil is not warm to any appreciable depth, shallow planting should always be practised. In summer, when the soil is warmer, and the evaporation greater, recourse must sometimes be had to deep planting in order to get down to moisture. At this time of the year thunderstorms frequently intervene between planting and the appearance of the crop above ground, but no apprehension should be felt for the safety of the stand if the set surface is broken by harrowing before the plants appear.

A feature peculiar to the maize crop, which is not possessed by most other crops, is that the male and female flowers, being on different parts of the plant, and cross pollination from one plant to another being the rule, it is essential that the whole crop should be flowering regularly throughout for fertilisation to be most effective. If, as sometimes happens, maize is planted in dry ground, and part of it comes up at once, and the remainder a fortnight or so later, after rain, it will be seen that fertilisation is seriously interfered with, and an appeciable loss of yield is the result. It is, therefore, necessary, in order to secure the best results, that maize should be planted in ground that is sufficiently moist to bring the whole crop up at once. From this point of view, the heavy concave divided wheel which firms the furrow soil after planting (such as is attached to most of the modern maize planting machines) is a very important part of the machine. Where maize is planted by hand, it is advisable to roll the ground or firm the furrows by some means to make up for this deficiency.

Not only does the yield suffer from lack of fertilisation of later germinating plants, but these, as every farmer has doubtless observed, never enter into competition with their more advanced neighbours, and always result in weaker and inferior plants in every way.

As regards the hill *v.* single-grain system of planting, it has been observed from the experiments conducted so far that, on fertile soil, where maize suckers freely, the hill planting yields best, probably because it inhibits the formation of suckers to a large extent, while on less fertile soil, where maize does not sucker, the single-grain system gives the best yield.

Conclusion.

These are by no means all the factors which influence yield in maize, but only some which are not generally considered or are likely to escape observation, and to which more attention could profitably be given by our maize-growers.

Milk and Butter Returns on the Bodalla Estate.

M. A. O'CALLAGHAN.

THROUGH the courtesy of the Manager of the Bodalla Estate, I am in a position to place before readers the results of their average milk yields at their different farms for the year ended 31st March, 1915.

The particulars given are very interesting, especially at the present time when the productive capacity of our dairy cattle is so closely under review. It will be noted that only on two farms out of eleven do the records fall below the standard of 500 gallons of milk, and at one of these farms only culls are milked; while on the other the yield is only barely below the standard mentioned.

It will also be noted that the best performance for milk stands to the credit of the grade yellow-and-white Holsteins.

I understand that individual records are not, generally speaking, kept at Bodalla, but among a herd of ninety-seven cows, with an average of 739 gallons of milk per cow, there must be some very heavy yielders.

The position of the Shorthorns, showing an average of 616 gallons, is very satisfactory, and it seems a pity that the Bodalla Estate does not pay more attention to the question of raising young Shorthorn bulls to be used for stud purposes in other herds.

The season at Bodalla for the year under review may be put down as a good one; but they had some floods which interfered to some extent with the production for a time.

ANNUAL RETURN for the Year ended 31st March, 1915.

Name of Farm.	Breed of Cows.	Cows Milking.	Cows Dry.	Total Cows.	Total Milk.	Yield per Cow.	Butter Fat.	Average Duration of Lactation.
					lb.	gallons.	per cent.	days.
Comerang	Holstein grades, yellow and white	83	14	97	71,735	739	3·69	312
Home Farm	Holstein	75	13	88	60,809	691	3·68	311
Long Flat	Ayrshire grades	66	13	79	52,831	668	3·78	304
Greenway	Holstein grades, black and white	66	19	85	53,333	627	3·90	293
Central Bails	Shorthorn grades	75	21	96	59,470	619	3·81	285
Greenwood Park	Shorthorn	79	24	103	63,449	616	3·72	279
Blind Ned's	Holstein-Jersey grades	47	18	65	38,298	589	3·90	263
Trunketabella	Ayrshire	79	21	100	58,424	584	3·76	248
Bumbo	Jersey grades	35	13	48	25,690	535	..	206
Cooper's Island	Ayrshire grades	69	23	92	45,252	492	3·80	278
Riverview	Culls from all farms	49	41	90	30,566	339	3·87	193
		723	220	943	550,925	593	3·70	279

Grasses with Creeping Roots:

ADVANTAGES AND DISADVANTAGES.

E. BREAKWELL, B.A., B.Sc., Agrostologist.

SOME of the commonest creeping grasses growing at present in New South Wales are Johnson grass (*Sorghum halepense*), Couch grass (*Cynodon dactylon*), Rhodes grass (*Chloris gayana*), and Summer grass (*Panicum sanguinale*). To these might be added a very common pasture grass which has developed, in certain localities, a distinct stoloniferous tendency, viz., *Paspalum dilatatum.*

Johnson Grass.

The root system of Johnson grass differs from the others mentioned, in that the creeping part—called the rhizome or rootstock, and which is concealed beneath the surface of the soil—arises from the lower part of the original rootcap or origin of the root (Fig. 1). In Couch and other grasses the creeping runners arise, as a rule, from the portion above the rootcap. In Johnson grass, also, the rootstock generally assumes at first a downward movement, to be followed later by a horizontal or upward one.

The rootstock partakes of the character of the stem, and usually produces from its apex some kind of aërial stem, which rises into the sunlight. The stem nature of the rootstock is partly seen in the presence of nodes and internodes. From the nodes, roots are generally produced, or, in their absence, scale-like leaves. While the advancing apex generally rises into an ordinary stem, the opposite and older end gradually dies away.

The modification which takes place in the rootstock when it emerges as an aërial stem can be well seen by a microscopic examination of cross sections of the rootstock and stem.

The principal points of interest to be noted in the rootstock (Fig. 2A), are as follows:—

(1.) The woody bundles (V.B.), which convey the water and nutrients through the plant, are distributed fairly regularly and are not crowded near the surface. In the rootstock the whole cellular tissue of the plant is utilised either for conveying the nourishment required for growth, or for storing nutriment for future use. The latter function is confined to the cells marked S.C.

(2.) A cuticle (Cu) and two rows of hard-walled cells (Sc) are present as a protective covering. The rootstock does not require as much protection from mechanical and other agencies as the stem. This is also well seen in the thin-walled cells (B.S.) surrounding the bundles.

Comparing this structure with that of the stem (Fig. 2B), it will be seen that—

(1.) The vascular or woody bundles (V.B.) become more crowded near the periphery. As is well known, the internal cells of the stem gradually lose their solid character and assume more of the nature of pith cells. The

conveyance of water and other nutriment is therefore confined to the border, and the internal cells gradually collapse. It is thus evident that the storage cells for maintaining the vitality of the plant are mainly restricted to the rhizome or rootstock.

(2.) Since the conducting woody bundles are confined to the border or periphery, more protection from agencies such as heat, animals, &c., is required than in the case of the rootstock. This extra protection is seen in the greater development of thick-walled cells (Sc and Cu). The bundles themselves are also surrounded by a layer of thick-walled cells (B.S.).

The modification which therefore takes place is devoted, not so much to a change of shape or number of cells, as to a change in their position and strength, a modification entirely due to external conditions.

Advantages of rootstocks.—There are still some pastoralists who advocate the growing of Johnson grass as a fodder. Owing to the vitality of the rootstocks the grass will last over a dry period, and quickly produce new growth on the approach of rain. In the dry western districts, where cultivation is little carried out, Johnson grass may be recommended, but its pernicious habit of spreading on to cultivated lands bars its introduction into closely settled areas.

Disadvantages.—The rootstocks of Johnson grass develop so quickly on cultivated lands that eradication, when the grass is once established, is an extremely difficult matter. The only sure method is to plough, harrow, and remove all the rootstocks. Such a complete method is often practically impossible; but by ploughing and continually cropping the new plants arising from the rootstocks left in the soil, the vitality of the rootstocks should be gradually exhausted, the latter cease to spread, and the plants should eventually die.

In hard ground the development of the rootstocks is considerably checked, but the vitality is so great that after lying in the ground for some time without shooting a ploughing or other cultivation will rejuvenate them into fresh life.

Couch Grass.

This grass does not produce, as a rule, underground stems like Johnson grass. It produces long creeping runners which are either exposed or close to the surface of the ground. The manner in which the stems are produced from the runners also varies. In Johnson grass the stem gradually emerges from the apex, many of the nodes only producing scale leaves, whereas in Couch it is the general practice for every node to root and produce new flowering stems. (*See* Fig. 3.)

Advantages.—Like Johnson grass, the runners have great vitality, and it is this fact which renders Couch so valuable as a fodder grass and so troublesome as a weed. Unlike Johnson grass, however, Couch will stand close cropping. The root system is extremely well developed, and all the new plants produced from the nodes are individually as strong as each other. The rapidity of growth of the new shoots of Couch is almost proverbial.

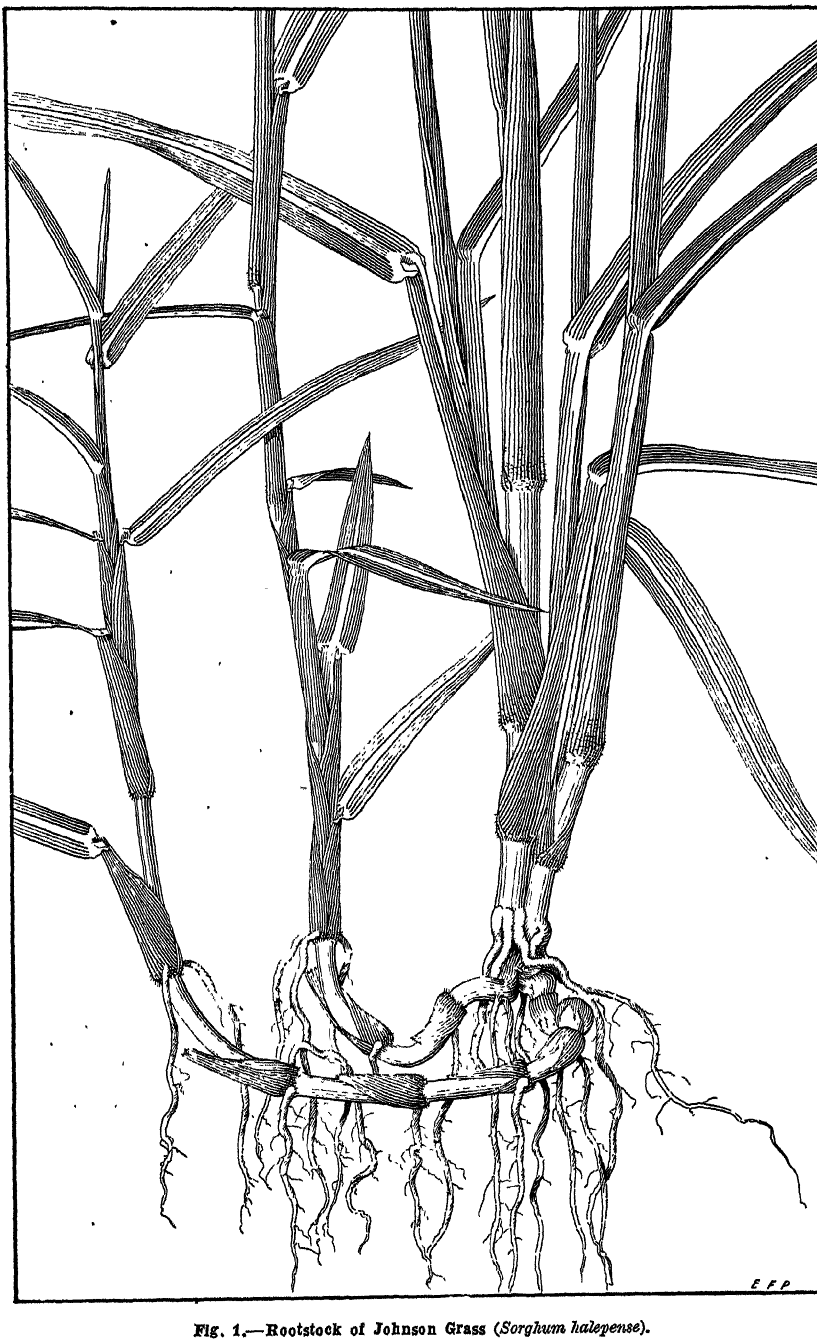
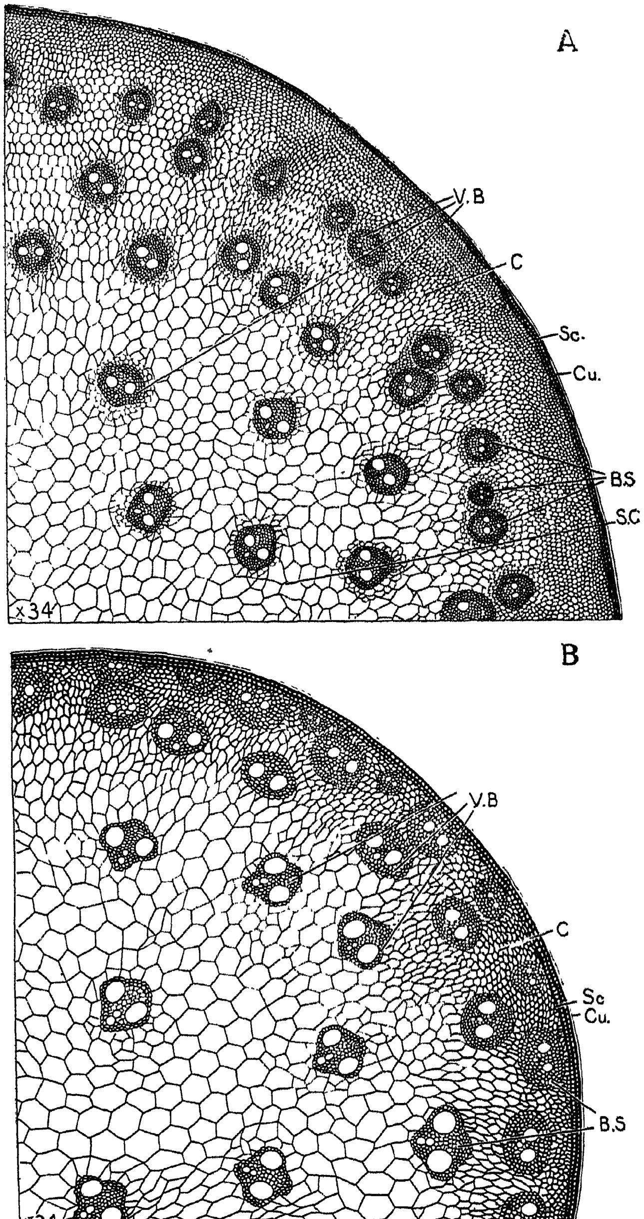


Fig. 1.—Rootstock of Johnson Grass (*Sorghum halepense*).
Note that it arises from the original rootcap.

GRASSES WITH CREEPING ROOTS.



ig. 2.—A. Cross-section of rootstock of Johnson Grass showing internal structure.
B. Cross-section of stem of Johnson Grass showing internal structure.

Explanation of letters.

V.B.—Vascular or woody bundles. B.S.—Woody bundle sheath.
C.—Thin-walled parenchyma cells. Cu.—Cuticle.
Sc.—Thick-walled parenchyma cells. S.C.—Storage cells.

GRASSES WITH CREEPING ROOTS.

Fig. 3.—Root system of Couch Grass (*Cynodon dactylon*). Note the abundant shoots from the numerous nodes.

GRASSES WITH CREEPING ROOTS.

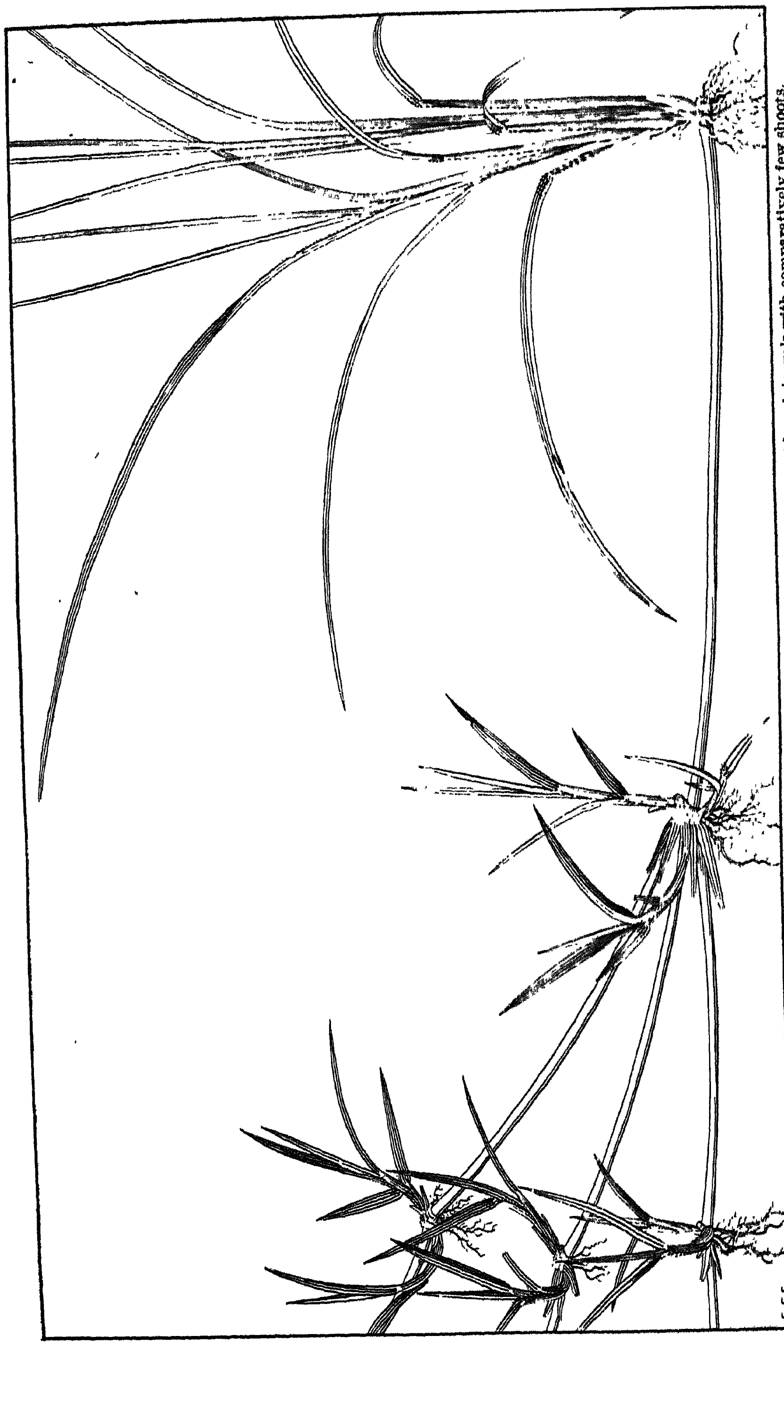


Fig. 4.—Root system of Rhodes Grass (*Chloris gayana*). Note that the runners have nodes at long intervals with comparatively few shoots.

GRASSES WITH CREEPING ROOTS.

Disadvantages.—Like Johnson grass, any portion of the creeping stem is capable of producing a new plant. Unless buried very deeply, ploughing, without removing the creeping stems, simply aggravates the evil tendencies of the plant, the looseness of the soil giving free play to the runners.

Experiments carried out in America show that Johnson grass in lucerne fields can be checked, if not destroyed, by constantly cutting with the lucerne, and the value of the latter is not materially affected. But to expect a good crop of lucerne on Couch-infested land is practically out of the question.

Two enemies of Couch are frost and shade. Where possible, advantage should be taken o this, if it be necessary to clean a Couch paddock for cultivation. For example, by ploughing and harrowing well in the late autumn and exposing the roots to the winter frosts, again ploughing and harrowing in the spring and laying down thickly to a summer crop (especially if it be broadcasted), it is quite possible to have the land fairly clean for the final cultivation in the following autumn.

Rhodes Grass.

Although partaking of the same creeping character as Couch, Rhodes grass differs somewhat from that plant in the fact that new stems from the nodes are not so easily produced. (*See* Fig. 4.) On dry soil it is a common practice for the runners to go some considerable distance before finding a suitable place for lodging; and even when lodging takes place, the new plant seldom has the strong root system of the original, and the roots are easily pulled out.

In loose, moist soil, if sown thickly, Rhodes grass has a tendency to lose the stoloniferous character and to produce larger plants with a well-developed root system.

Advantages.—The stoloniferous tendency of Rhodes renders it, as in the case of Couch, a very valuable pasture grass. New shoots from the nodes are produced almost as rapidly as in Couch.

Summer Grass.

Summer grass (*Panicum sanguinàle*) differs somewhat from the other grasses just enumerated, inasmuch as the runners only form under favourab'e conditions. If the knotted nodes of the stem be surrounded by moist soil, or protected from the air and light, the new production is a root (*see* Fig. 5); whereas if it remains exposed to the air and light, it develops into an ordinary stem. It is also to be noticed that in some cases roots begin to be produced from nodes of the stem which are some distance above the ground, illustrating the tendency of the plant to produce rooted nodes.

When Summer grass plants develop runners the same remark applies as in Couch. Any portion of the runner will produce a new plant, and the grass thus becomes exceedingly troublesome on cultivated soils.

The short-lived character of Summer grass, however, renders it less noxious than Couch as a weed, and it is only in summer crops that it becomes troublesome.

Paspalum dilatatum.

A tendency for developing runners, hitherto unrecorded, is also very noticeable in the Paspalum pastures of the Richmond and Clarence River districts.

Close observation shows that actual runners are produced on heavily stocked, lightly stocked, or even protected pastures. The characteristic is more noticeable in soils where the plants are not crowded.

In many cases the nodes on the upright stems become extremely swollen, covered with a dense coating of hairs, and finally partake of the character of the ordinary stem-base of the plant. Many of these aërial nodes often produce roots. (*See* Fig. 6.)

A comparison of the structure of these air-roots with that of the soil-roots is seen in Figs. 7A and B. It will be noticed that the small difference between the two is due to position and adaptation to environmental conditions. For example, in the air-root (Fig. 7A), no root hairs are required to absorb the moisture from the soil. They are, therefore, replaced by a cuticle or protective covering (Cu), which protects the epidermal cells (E) from mechanical and other agencies. The cortex or outer portion of the root is provided with cells with the long axis parallel to the circumference. This arrangement may be due to the need for the facility of supply of water and nutriment, as the air-root obtains its nourishment wholly from the other part of the plant and not directly from the soil as in the soil root.

The soil-root (Fig. 7B), as is customary with all roots of grasses, has an outer band of epidermal cells (E), which develop root hairs (R.h.). These root hairs, of course, absorb the nutriment necessary from the soil. It will also be noticed that the cortical thin-walled cells (C.p. P.) are polygonal in shape, unlike those in the air-root. This is the usual structure in grass roots.

It is thus evident that under suitable conditions, *i.e.*, when surrounded by the soil, the air-roots would have no difficulty in becoming soil-roots. Why Paspalum possesses the tendency to develop these roots under favourable conditions is not quite clear. It has to be remembered that many grasses of the Paspalum genus become stoloniferous, *e.g.*, *Paspalum distichum* (Water Couch), and many others. The tendency to form secondary roots may also be helped by a temporary stagnation of growth, such as may be caused by dry conditions. Renewed and extra vitality is given to the nodes on the return of favourable conditions, and this finds expression in the development of roots.

It is probable that the stoloniferous tendency of Paspalum will be an advantage from a pastoral point of view. At the present time one of the main drawbacks to Paspalum is the matted character of the roots after a certain period of development. If the grass can spread by runners, and develop new plants from the runners, the matted character is likely to be diminished. It is apparent, however, that the grass requires to be sown thinly to help the development of such characteristics.

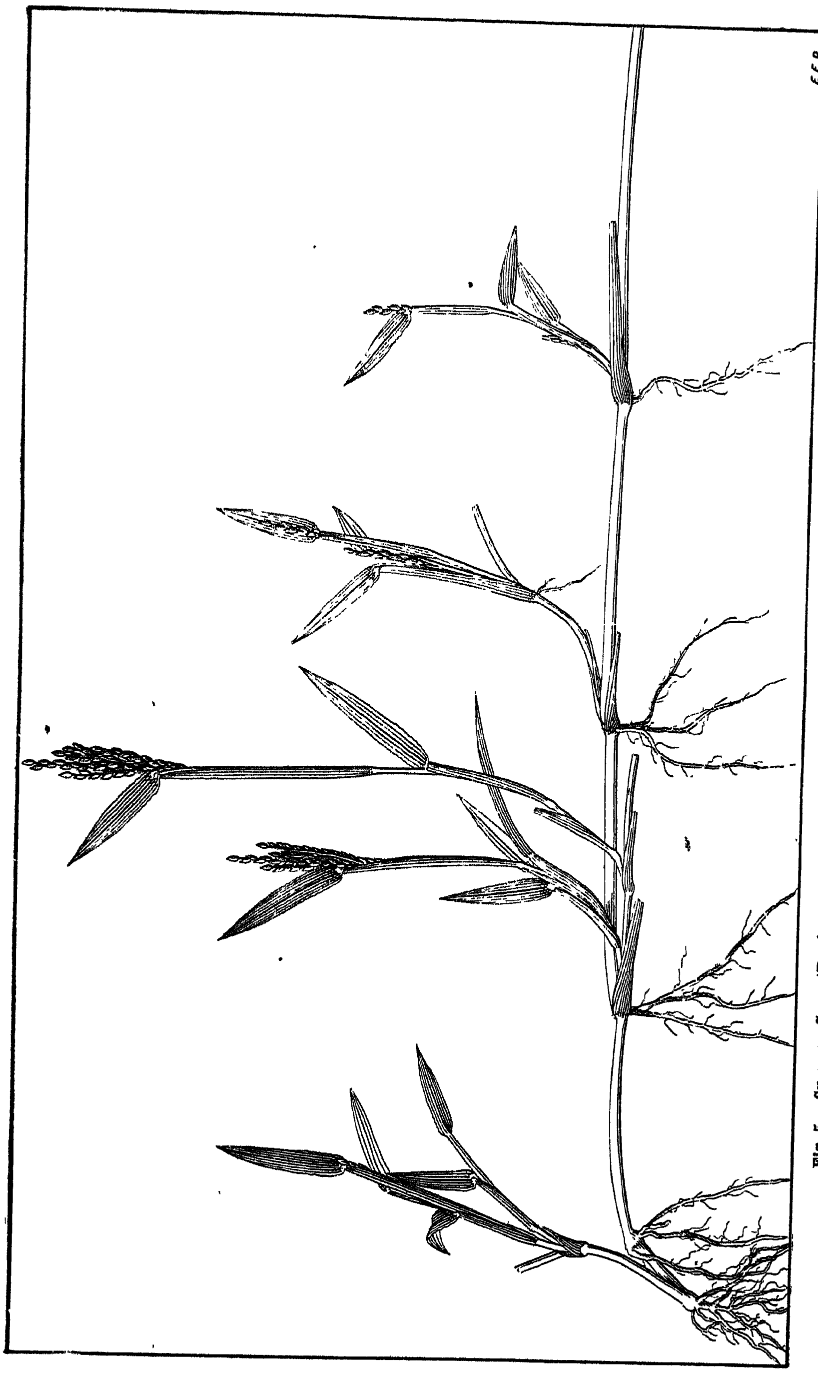


Fig. 5.—Summer Grass (*Panicum sanguinale*), showing extensive nodal root development under favourable conditions.

GRASSES WITH CREEPING ROOTS.

Fig. 6.—*Paspalum dilatatum*, showing creeping root system.

GRASSES WITH CREEPING ROOTS.

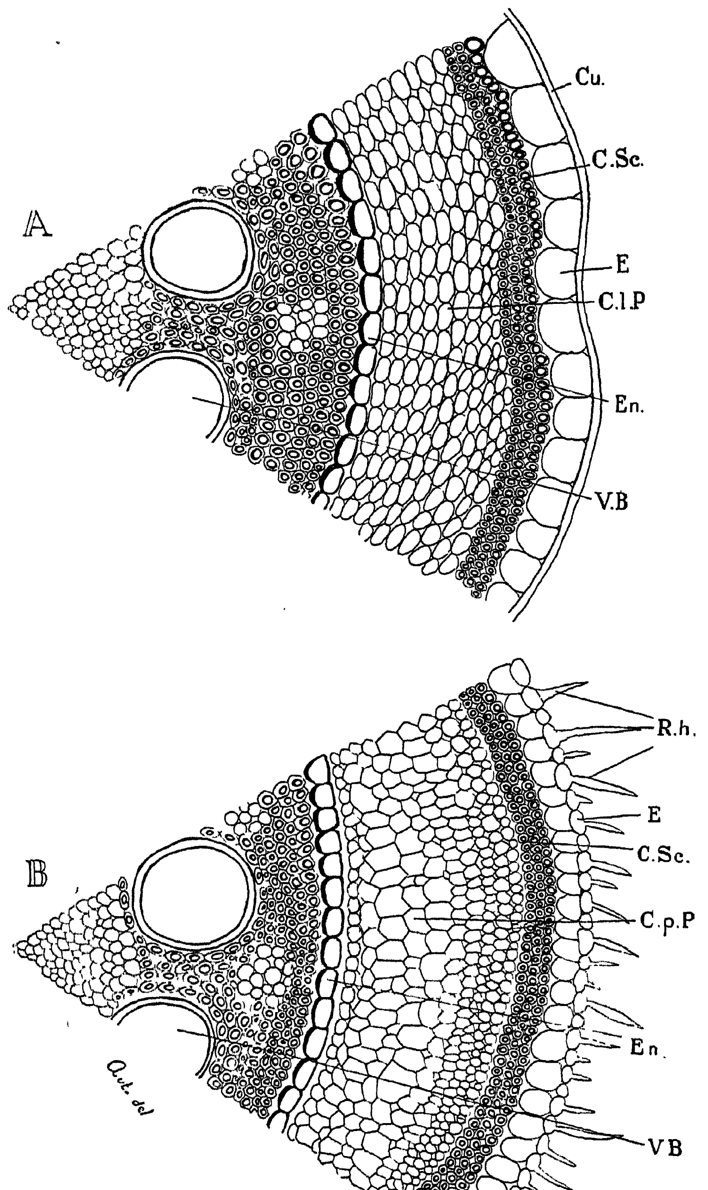


Fig. 7.—A. Cross-section of air-root of Paspalum showing internal structure.
B. Cross-section of soil-root of Paspalum showing internal structure

Explanation of letters.

Cu.—Cuticle.
E.—Epidermal cells.
C.Sc.—Thick-walled cortical cells.
C.l.P.—Thin-walled longitudinal parenchyma cells.
En.—Endodermis or bundle sheath.
R.h.—Root hairs.
C.p.P.—Thin-walled polygonal parenchyma cells
V.B.—Vascular or woody bundles.

GRASSES WITH CREEPING ROOTS.

Practical Irrigation-farming in Australia.

WITH SPECIAL REFERENCE TO FRUIT AND FODDER CROPS.

A. M. MAKINSON, B.A., Organising Inspector, Agricultural Bureau.

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PART V.

Pegging-out and Planting.—Vine-trellising.—Cultivation.—Manuring.

Requisites for Planting.

For pegging-out and planting the requisites are:—A planting wire (a 12 to 14 gauge wire cord, seven to ten chains in length), an ordinary crowbar, a short bar, a heavy hammer, a light batten, the length of which equals the width between the rows to be planted, a quantity of pegs. Two men are required for the work.

For vine-pegging short pieces of tape are slipped between the strands of the planting wire, at intervals as far apart as the vines are to be planted *in the rows*, to mark where the pegs are to go in when the wire is stretched. For tree pegging an additional rod or batten the length of which equals the distance between the trees to be planted *in the rows* will be required. This rod is carried along the wire when stretched to measure the distance from peg to peg, one end of the rod abutting against each peg from which measurement is taken, and the outside edge of each successive peg put in flush with the other end. For pegging out an orchard pine or deal pegs, 6-in. to 8-in. long, are good enough, but where a vineyard is to be planted with resistant vines, it is advisable to use pine pegs, 2 feet to 2 feet 6 inches long, which may be used to support the young vines until they are trellised. After trellising these pegs may be stored for future use.

Methods of Planting.

There are three methods of planting in general use: Square planting, in which the trees are planted in a series of squares; rectangular planting, in which the trees are planted in a series of rectangles, and septuple planting, in which they form a series of equilateral triangles.

For planting a block on the square, the following method may be used—First mark out the headlands, 18 feet to 24 feet in width, as may be thought necessary, with lines parallel to the head-ditch, and other boundaries of the block.

Then mark out from a point A on the head-ditch a straight line to a point B on the opposite side of the block, in the direction in which it has been decided that the water shall flow in the furrows. Peg a line DE crossing the line AB

at right angles, at such a point C as may be found convenient according to the size and shape of the block. Stretch the planting wire along DE (which is called a base-line), by means of crowbars and hammer. Peg the base line, measuring with the rod cut to the length of the distance between rows, starting each way from C. Then peg the line AB, starting from C, and follow on pegging the other rows parallel to AB, starting from each successive peg on the base line, the man at the end of the wire remote from the base-line, using the rod to measure the distance from row to row.

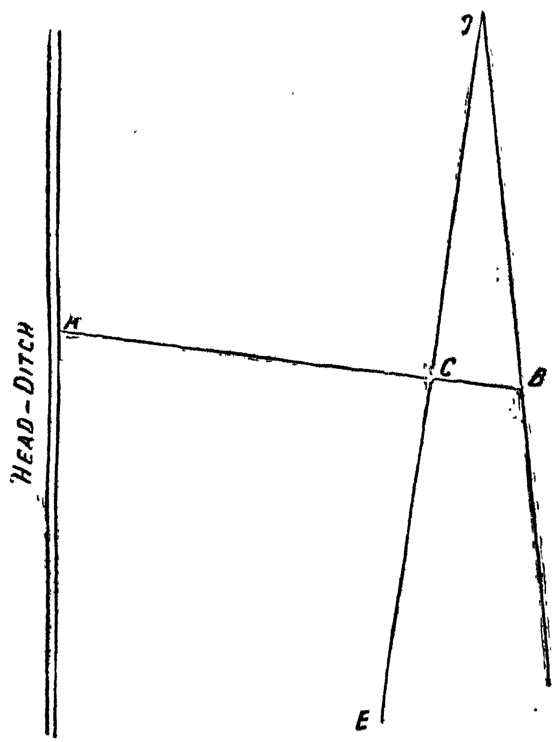


Fig. 22.

The procedure in pegging for rectangular planting is the same as that for square planting, except that the intervals at which the base-line is pegged will be different from the distance between the pegs in the rows.

The procedure is the same again in septuple pegging, except that :—

(1.) The base-line is pegged out at intervals, of what is called the *check-row distance* (given in the planting table for different distances of planting).

(2.) In pegging the rows, the first peg in every alternate row will be not the peg on the base-line, but a peg put in half the planting distance from it along the row.

PLANTING TABLES.

Distance apart in feet.	Number per acre.		Check-row distance in septuple system.	
	Square.	Septuple.	feet.	inches.
32	42	47	27	8½
30	48	55	25	11⅘
28	55	63	24	3
26	64	73	22	6⅛
24	75	86	20	9½
22	90	103	19	0⅞
20	108	125	17	4
19	120	138	16	5⅜
18	134	154	15	7
17	150	172	14	8¾
16	170	195	13	10¼
15	193	222	13	0
14	222	255	12	1½
13	256	295	11	3
12	302	347	10	4⅞
11	360	414	9	6
10	435	500	8	8
9	537	617	7	9½
8	680	782	6	11⅛
7	889	1,022	6	0¾
6	1,201	1,381	5	2⅜
5	1,742	2,003	4	4
4	2,722	3,130	3	5½
3	4,840	5,566	2	7⅛
2	10,890	12,523	1	8¾
1	43,560	45,738	0	10⅜

RECTANGULAR PLANTING.

Distance apart in feet.	Number per acre.	Distance apart in feet.	Number per acre.
30 x 20	72	32 x 20	68
30 x 18	80	32 x 18	75
30 x 16	90	32 x 16	85
12 x 10	363	10 x 10	435
12 x 8	453	10 x 8	544
12 x 6	605	10 x 6	726
12 x 5	726	10 x 5	807
12 x 4	907	10 x 4	1,088

Tree and Vine Planting.

The septuple system of planting is to be recommended for trees in preference to square planting, because it allows three ways for cultivation instead of only two, and also because an orchard or orange grove when so planted presents a more attractive appearance. The usual planting distance for fruit trees ranges from 18 feet to 24 feet, according to the size to which particular varieties are likely to grow in a given soil. When slow-growing trees, such as the orange, walnut, prune or pear, are planted with a good distance (24 feet or more) between them, they may often be profitably

interplanted with fast-growing trees, such as peach or nectarine, which will bring in an income before the slower-growing trees have begun to pay for water and cultivation, or with trees that do not grow to a great size, such as the mandarin or the Japanese plum. The interplanted trees may be rooted out in years to come, when the slower-growing varieties obtain such size as to leave no room for them.

When a block has been pegged-out the holes may be dug, but if the ground is dry it should be irrigated beforehand. For vine-planting the holes are dug as near as possible to the pegs as they stand without disturbing them, and as each vine is planted a peg is taken out and the vine put in its place. For trees, the planting of which should be more accurate than is generally thought necessary for vines, the holes are dug midway between every two pegs in the rows, a rod half the planting distance in length being carried by the digger; and for planting trees a batten is used notched at each end to take the pegs on either side of the hole, and in the middle to take the tree. Holes should be dug a little deeper than the depth necessary to take the tree or vine, especially if the ground is hard or clayey, and surface soil should be put in the bottom of the hole when planting; if there is a limestone or other crust between surface soil and subsoil it should be broken with a bar.

The Time for Planting.

Planting may be done from June till October early or late according to the kind and variety of fruit to be planted, its blossoming season, and the extent to which it is liable to damage by frost. In districts subject to frosts citrus trees should be planted late, or else effectively protected by cover of some kind as soon as planted. Most other fruits are better planted early, prunes and plums particularly. There is some risk in the early planting of sultanas, the shoots of which are very delicate, where late frosts occur and a vineyard has a bad aspect.

While planting is in progress the roots of trees or vines should not be exposed to the sun, but should be carried in a bucket of water or a wet bag until they are placed in the holes. The roots of trees and vines should be pruned hard back before planting, the cuts made to face downwards. Tops also of vines should be pruned hard back at the same time, but in cases of early planting it is better to defer pruning the tops of young trees till the early spring. Citrus trees get a better start if their roots are balled with earth on being dug up in the nursery.

Cross-Pollination.

If it is proposed to plant for market purposes a single variety only of any kind of fruit, a few trees of other varieties of the same kind, and which blossom at the same time, should be planted at regular intervals among them, n order that their product may be increased by cross pollination. The pollen of some varieties is of much greater fertility than that of others, and that of a few is infertile if the tree is isolated.

Vine Planting.

Vines now-a-days are usually planted rectangularly, with a greater distance *between the rows* than between the *vines in the rows*, in order to permit the use of large ploughs and cultivators, and at the same time allow of a sufficient number to be planted to the acre.

The following distances are recommended for the planting of raisin and distillery varieties of vines :—

	feet.
The Currant vine	12 x 10.
„ Sultana	12 x 6.
„ Gordo Blanco...	12 x 4 or 5.
„ Waltham Cross	12 x 4 or 5.
„ Doradillo	12 x 4 or 5.

The space of 12 feet between the rows will enable a 3-furrow plough, also a 6-feet disc-harrow, each drawn by three horses, to be used.

Vine Trellising.

It has been found advisable to trellis all the above varieties—the Gordo Blanco,* Waltham Cross and Doradillo with a low one or 2-wire trellis, the sultana with a 3-wire trellis, about 4 feet 6 inches high, and the currant with a 3—or if a T-head is used—a 4-wire trellis, 5 feet to 5 feet 6 inches in height. The T-head has much to recommend it for the currant vine, but makes the trellis somewhat expensive when complete, and a substitute may be found in a system of pruning, which will be described in a later chapter.

Vines should be trellised as soon as possible after planting, as it is very desirable to get them on the wires during the first six months of their growth, and train what will afterwards be the main stem to be straight and well-formed from the beginning by rubbing off as soon as they appear shoots that will not be needed. The young vine also is much less liable to be injured by wind-scorch or flying sand when attached to the wire.

For putting up a vine trellis split hardwood posts are to be recommended in preference to pine or other soft woods. Posts should be thoroughly seasoned before they are put in the ground; they should be put in to a depth of 20 inches, and strainers to a depth of 3 feet 6 inches and from 20 feet to 30 feet apart in the rows. Eleven and a half and 12½ gauge galvanised steel wire will be found the most economical and satisfactory for a vine trellis; it stretches very little after being strained, but being liable to snap afterwards in cold weather if twisted or hammered while being strained and fastened, it is well to use a short piece of soft galvanised No. 8 or No. 10 (joined to the steel wire by a figure-of-eight knot) for fastening to the strainers.

A T-head may be put up by bolting pieces of hardwood 3 inches x 2 inches x 1 foot 6 inches or 3 inches x 2 inches x 2 feet horizontally to the top of each post. The ends of these T-pieces, as they are called, are bored, and two wires pass through each end, instead of one wire through the top of the post.

* It is not generally worth while to trellis the Gordo on a heavy soil.

A slot should be cut in each post for the T-piece, or else each T piece should be fastened by two bolts, or they will tilt with the weight of fruit on one side or the other.

To put up a trellis properly care is necessary in sighting the posts to get them every way in line. Where the sinking is good, and the posts are delivered on the ground, 4d. to 4½d. per post is a fair price for putting up a 3-wire trellis—the total cost of which runs to from £8 to £10 an acre.

CULTIVATION.

The direct results obtained by proper cultivation of the soil may be classified under three heads:

1. *The Conservation of Moisture*:—
   (a) By disturbing the capillary action which is set up when the soil is allowed to 'set' after rain or after irrigation, and by means of which moisture in the earth is absorbed by the atmosphere.
   (b) By the destruction of weeds, which if allowed to grow unchecked take a proportion of the moisture available.
   (c) By turning in vegetation (effected in ploughing) which forms a lining by which capillary action is checked until such vegetation rots and becomes part of the soil.

2. *Improvement in Quality*:—
   (a) By letting in the air from which the soil obtains nitrogen and which in turn carries off injurious gases.
   (b) By turning into the soil the vegetation growing upon it by means of which:—
      1. The chemical constituents are improved, the soil absorbing from the decaying vegetation the nitrogen, potash and phosphoric acid taken out by it; and
      2. The physical texture is improved, a heavy soil being made more friable, and a light soil firmer.

3. *Cultivation prevents injury to the soil* through the rising of injurious soluble salts from the sub-soil and beneath it where they are comparatively harmless, to the surface soil where, if allowed to accumulate, they become very injurious. This is especially the case on land where the natural drainage is poor, where salts dissolved by water are not carried away, but rise with the moisture by capillary action (unless that action is disturbed by cultivation) and are deposited on the surface as the moisture evaporates.

The more important reasons for the thorough cultivation of lands dependent solely on rainfall for moisture are contained under headings (1) and (2), the main consideration being the conservation of moisture; but where irrigation is practised and the sub-soil is always kept moist, the partial loss of such moisture by evaporation is not of such moment in itself as the fact that in the process of evaporation the surface soil of the land is often spoiled by the accumulation of injurious salts. In other words, while on unirrigated lands

deficient cultivation is followed by poor crops and the gradual but slow impoverishment of the soil, on irrigated lands it will lead not only to these results, but in many cases to rendering the soil permanently useless as well. Thorough cultivation is therefore even more essential to the irrigationist than to the dry-farmer, and the more thoroughly an irrigation farm is cultivated the less water it will need.

As summer is the season of greatest evaporation of moisture, and is also the period during which the soil derives most nitrogen from the atmosphere, so in summer is most frequent cultivation necessary. A fruit farm should be cultivated at least once after every irrigation or fall of spring and summer rain, but the period which should be allowed to elapse between the application of water and succeeding cultivation depends on the texture of the soil. Stiff sticky land should be cultivated as soon as the surface is dry enough for horses and implements to work on it, and before it has had time to harden, more loamy soils as soon as a crust has begun to form. It is seldom necessary or advisable to delay cultivation for more than four days after an irrigation is finished, and the cultivator may in many cases be set to work on the day after the water is turned off.

Cultivators.

There are many kinds of garden cultivators, but they are all either of the disc or tine types. A disc and a tine cultivator (or one of those useful machines with a variety of movable attachments) should be kept on every fruit farm and used as one or the other may be best adapted for the destruction of different weed growths, and to bring the particular soil to that loose tilth to obtain which should be the aim of all clean cultivation. A disc harrow is particularly useful to the irrigationist, as it enables him very often to rectify minor defects in the grades of his land caused by drift or accident, and there can be no doubt of the beneficial effect of moving the surface soil to and fro from one cultivation to another by means of this implement.

For the eradication of annual weeds like thistles or paddy-melons the disc cultivator is the most useful implement, but for the destruction of perennial deep-rooting pests, like Couch grass or Johnson grass, the disc is quite useless, as it chops them up into pieces which are spread about and take fresh root. The tine cultivator will help to keep down perennial grasses, but if they get a firm hold, the only way to get rid of them, other than by hand grubbing, is by using the skim-plough. This implement (which must not be confused with the skim-plough used by wheat farmers) is designed for the extermination of Couch grass, and consists of a strong rectangular frame with two small front wheels and two sharp knives set at right angles to one another, bolted to bodies clamped to the frame. The knives cut the Couch grass about three inches under the surface of the ground and leave it lying in strips. Coulters may be clamped to the fore part of the frame with advantage to help the work of the knives if the grass is very thick. It takes from four to eight horses to draw this implement according to the growth of grass and the character of the soil through which it has to pass.

A cultivation implement which saves a great deal of handwork in a vineyard is the grape hoe, which may be worked with a share, tine, disc or knife attachment. This implement, which is designed for working close up to rows of grape-vines, and cultivating the strip under a trellis left untouched by the plough, is steered in and out independently of the horse drawing it, and is exceedingly useful, but requires a steady horse and practised driver. Similar work may be done close up to fruit trees by using a disc harrow, extended and swinging from one row to another, "doing the figure eight" as it is sometimes called. The soil should be cultivated at different depths because a hard pan is apt to form at the depth of cultivation if it is always the same.

Sub-soiling.

Stiff clay soils may be sub-soil ploughed with advantage before planting. The work is done most economically and effectively by steam tractors and it will pay the average fruit farmer to get it done by contract if he can. The benefit derived from sub-soiling is that it encourages trees and vines to root deeply and is especially valuable when there is a crust between the sub soil and surface soil. Explosives may be used as a substitute for sub-soil ploughing in certain classes of country, and though not so effective within the ploughing depth may be made to loosen the soil at a greater depth than any plough could reach.

Ploughing.

Ordinary ploughing should be carried out in the autumn and if an annual green manure is sown, again in the spring.

The depth to which an orchard or vineyard should be ploughed varies from 3½ inches to 7 inches, according to the character and depth of the soil; light loams may usually be ploughed deeper than heavy soils, and deep soils will stand deep ploughing; shallow soils very often will not. A citrus plantation, for instance, on a rich but shallow soil must not be ploughed at all, or the best part of the feeding roots of the trees will be destroyed; while in a deep soil the destruction of surface roots will do little or no injury to the trees.

Ploughs may now be had in many patterns, adapted to different classes of work, and what may suit one orchardist may not suit another. The modern tendency is to shorten the mould-board as much as possible in order to lighten the draught and make it possible to do more work with fewer horses; also, to make the plough as compact as possible in order to make turning easy and enable the near side to pass close to trees or vine-trellis. The short mould-board does not make such "pretty" work as the long one, especially in stiff soils, but in light loams, at any rate, it is generally effective. It pays to use a three-furrow plough in a large orchard or vineyard— it may be followed by a double or single furrow if necessary.

The most important points in ploughing are to cut straight furrows, to turn the soil, completely burying all weeds and rubbish, and to vary the depth slightly on different occasions. After ploughing, if a crop of weeds or other growths has been turned in, and if the work has been well done, the land may be left for some time undisturbed, as the layer of vegetable matter will, until it has had time to decompose, prevent the loss of moisture through capillary attraction.

Manuring.

Artificially applied fertilizers are more necessary for, and play a larger part in, the development and success of an irrigation farm than in the case of farms dependent on the rainfall, because—

1. An irrigation farm produces larger crops, and the soil consequently becomes more quickly exhausted if the supply of plant-food is not replenished.
2. The soil of an irrigation farm also loses a certain amount of plant food through leaching by the water.
3. There is no risk of the manure lying unavailable as plant-food or blighting off crops through lack of moisture.

Of the chemical constituents which go to form plant-food, there are many which are present in the soil in such quantities that they never become exhausted.

There are others, however, which are liable to be used up, and with an artificial supply, of which most soils need to be replenished from time to time. They are—

1. Nitrogen.	3. Potash.
2. Phosphoric Acid.	4. Lime.

1. Nitrogen.—The cheapest method of supplying nitrogen to a plantation is by green-manuring, *i.e.*, planting leguminous crops. As is well known, these have the peculiar characteristic that they draw nitrogen directly from the air through their upper growth, and introduce it to the soil through their roots. Either an annual legume such as field peas may be used, or a perennial such as lucerne. Lucerne is very effective for introducing nitrogen to the soil, besides being profitable in other respects, and *where the water supply is sufficient; and the soil is of a suitable depth and of a loamy character,* it may be planted between the rows of trees in an orchard with great advantage to their growth and productiveness.

Lucerne is more effective for introducing nitrogen into the soil than annuals like field peas, rape, or tares, because its action is not confined to a few months' growth, but is more continuous, and increasing as the plant develops, a supply of nitrogen is carried by its powerful root system deep into the subsoil, and maintained there.

As Wickson wrote, more than a dozen years ago (Californian Fruits, page 165, edition 1900):—*There is now reason to believe . . . that where moisture is ample for both alfalfa and trees, we shall come to use this plant as a permanent cover of orchard ground, as a substitute for a part of the clean culture now observed.* The value of lucerne for this purpose has been proved over and over again in the irrigation settlements on the Murray, and it is only their limited supplies of irrigation water that have prevented its general adoption on suitable soils* in the river irrigation settlements. Lucerne

* In a shallow soil, or one which has a stiff clay sub-soil, or an impervious rock or clay pan between the surface and subsoil there is danger of the lucerne roots choking those of the trees, and therefore lucerne should not be planted with fruit-trees where these conditions prevail.

planted among trees in this manner may be treated in exactly the same way as lucerne growing by itself, provided the land upon which it is growing is suitable and kept well supplied with moisture, phosphoric acid, potash, and lime—that is to say, when the lucerne attains maturity at three years from planting, the land should be ploughed or deeply cultivated every year in the autumn, and may be planted with barley (with a good dressing of superphosphate or bone manure) to provide early feed for the spring; the lucerne itself may be cut for feed in the summer, or even fed-off if hurdles are used and stock prevented from injuring the trees. Land under lucerne should be cultivated or harrowed after cutting, and irrigated throughout the summer.

Lucerne, however, is not recommended for planting in a vineyard as a green manure, because the small space between the rows makes it difficult to deal with, and it is apt to smother the vines and keep light and air from the fruit. In a vineyard or in an orchard where a sufficient water supply to grow both lucerne and fruit is not available, or where the soil is not suitable for lucerne, field peas may be used as a green manure. A crop of peas should be drilled in (with a dressing of bone-dust or superphosphate) immediately before the autumn ploughing. After this ploughing, the land should be left uncultivated during the winter, but should be ploughed again to cover in the peas when they are approaching maturity in the spring.

Green manuring will generally supply the nitrogen necessary for fruit-growing if practised consistently. If peas are used, it costs little; if lucerne is grown, it is a profitable business in itself. Green manuring cannot begin too early on a fruit plantation, but where lucerne is to be planted among trees, the trees should be given two or three years' start of the lucerne to avoid any chance of their roots being choked by it. Field peas may be planted with advantage in the meantime.

Other nitrogenous manures are farm-yard manure, sheep manure, guano, and blood manure. These are all very useful, particularly the last-named, which may be obtained in a very convenient form mixed with bone manure (for phosphoric acid). Animal manures such as these are slower in their action but more permanent in their effect than mineral manures, and are for that reason to be preferred to them. It is worth noting that most of the blood manure manufactured in Australia goes to Japan, while we import from that country large quantities of mineral superphosphate. Animal manures should be applied in the autumn and winter.

Where a quick-acting nitrogenous manure is needed, sulphate of ammonia (contains about 20 per cent. nitrogen), nitrate of soda (contains about 15 per cent. nitrogen), or nitrate of lime (contains about 12 per cent. nitrogen) may be used, and should be applied in spring while the fruit is forming in the flower. Three-quarters of a cwt. to the acre is a fair dressing.

2. Phosphoric Acid.—Phosphoric acid may be applied in the form of bone-dust, bone and blood manure, or bone superphosphate; the last-named acts more quickly than the others. Mineral superphosphate is of doubtful value in an orchard, acting on the trees merely as a stimulant, and with no lasting

effect. Where a little nitrogen in addition to the phosphoric acid is desired, a bone and blood manure containing about 5 per cent. of nitrogen and 15 per cent. phosphoric acid will be found very useful. Phosphoric acid applied in this form will be slow in its action, and will not be immediately wholly available to the trees and vines as a plant-food; it will all, however, eventually become available, and will not leach from the soil.

3. Potash.—This may be applied in the form of wood ash, which, however, must not be allowed to get wet or mixed with other fertilizers before it is put in the ground; or in the form of sulphate of potash (contains about 52 per cent. potash), or muriate of potash (contains about 60 per cent. potash). Potash manures have not been hitherto so generally used in the irrigation areas of Australia as nitrogenous and phosphatic manures, the reason often being given that our districts of low rainfall are usually well supplied with potash. This may be so, but it must be remembered that fruit on the average contains more than twice as much potash as nitrogen, and the beneficial effects which a dressing of potash has on our inland plains is to a large extent illustrated by the wonderful growth of grass or crop that comes upon timbered land that has been swept by a bush fire. From ½ cwt. to 1 cwt. of muriate or sulphate of potash may be used to the acre.

4. Lime.—This makes part of the composition of a fruit, and is necessary to a tree, but the amount required for this purpose is small. It has, however, two other important uses, namely:—

1. Rendering other plant-foods which are insoluble or partially soluble more quickly available.
2. Improving the physical texture of the soil, making a clay soil more friable and a light sandy soil firmer.

There are many soils which need lime for both purposes, especially in "box" country. Either gypsum or ordinary burnt lime may be used, but the latter is to be preferred, as 1 ton of lime will go as far as 2 or 3 tons of gypsum. Lime should not be applied at the same time as other manures, but about six weeks beforehand. A dressing of from 5 cwt. to 10 cwt. to the acre may be used.

A good dressing of manure for average fruit-growing soil that has borne heavy crops would be 3 cwt. of bone and blood manure (containing about 15 per cent. phosphoric acid and 5 per cent. nitrogen) and ¾ cwt. of sulphate of potash. Such a dressing costs about 25s. per acre. But the fruit-grower should not blindly follow any general prescription; if he does, he runs the double risk of spending money on fertilizers which his orchard does not need and of failing to apply plant-foods that are urgently wanted. The ingredients of the most suitable fertilizer for an orchard depend on—

1. The varying amounts of potash, nitrogen, phosphoric acid, and lime which different varieties of fruit draw from the soil.
2. The varying proportions in which potash, nitrogen, phosphoric acid, and lime are available in different soils.

The following table, compiled from analyses by G. E. Colby, University of California, shows the percentages of potash, nitrogen, phosphoric acid, and lime in various fruits:—

QUANTITIES of Soil Ingredients withdrawn by various Fruits.

[Compiled from analyses by Mr. G. E. Colby, University of California.]

Fresh Fruit. 1,000 lb.	Total Ash.	Potash.	Lime.	Phosphoric Acid.	Nitrogen.
	lb.	lb.	lb.	lb.	lb.
Almonds* ..	17·29	9·95	1·04	2·04	7·01
Apricots ...	5·08	3·01	·16	·66	1·94
Apples	2·64	1·40	·11	·33	1·05
Bananas ...	10·78	6·80	·10	·17	·97
Cherries ...	4·82	2·77	·20	·72	2·29
Chestnuts* ...	9·52	3·67	1·20	1·53	6·40
Figs	7·81	4·69	·85	·86	2·38
Grapes	5·00	2·55	·25	·11	1·26
Lemons... ...	5·26	2·54	1·55	·58	1·51
Olives	13·50	9·11	2·43	1·25	5·60
Oranges ...	4·32	2·11	·97	·53	1·83
Peaches ...	5·30	3·94†	·14†	·85†	1·20†
Pears	2·50	1·34	·19	·34	·90
Prunes, French	4·86	3·10	·22	·68	1·82
Plums	5·35	3·41†	·25†	·75†	1·81
Walnuts* ..	12·98	8·18	1·55	1·47	5·41

* Including hulls. † Estimated.

Whether a soil is lacking in any of these ingredients must be ascertained either—(1) from the agricultural chemist, or (2) by local experiment.

The latter is a lengthy and expensive process, though it has been maintained by some writers to be the most reliable in the end. At all events, fruit-growers should get all the information they can from the agricultural chemist as to the character of their soils, ascertained from the analysis of carefully-taken samples, and make that information the starting point for any tests that may be considered necessary.

The Sowing of Fertilizers.

Artificial manures may be either drilled in or sown from a specially-made box attached to a single-furrow plough. If the latter method is employed, the land should be furrowed out as for irrigating beforehand, and the plough with the manure-box attached should follow in the same furrows, deepening them ahead of the manure as it is sown; the manure should then be covered in immediately by a single-plough following, which will leave the furrows ready for the water. This method is to be preferred to drilling in manures on a fruit farm if the manure is to be put in by itself; the drill will, of course, be used if seed for a green manure or crop is to be sown with it. The method of sowing by hand in the furrows is very expensive and wasteful.

The Purchase of Fertilizers.

Measures of precaution have been adopted by the Department of Agriculture in this as in other States, to prevent unscrupulous dealers in fertilizers from cheating the farmer, and to enable the farmer to get the best value for his money. Dealers are obliged to furnish to the Department and to purchasers samples, prices, and analyses of manures they have for sale. The Chemists' Branch of the Department analyses all samples, and from the analyses and the prices quoted calculates the *average value of a unit* of each of the fertilizing constituents in the manures submitted. From these average *unit values* the value per ton of each manure submitted is obtained and published in a table in the *Gazette*. For further information on the subject of fertilizers, the reader is referred to Mr. F. B. Guthrie's Bulletins (Farmer's Bulletins Nos. 16 and 17).

(*To be continued.*)

SHEEP BLOW-FLY INVESTIGATIONS.

THE experiments and investigations of the blow-fly pest by the Government Scientific Committee have been on the following lines:—

1. The breeding out and spreading of the Chalcid parasite (*Nasonia brevicornis*) which are being found in large quantities; in addition to the experiments already being conducted and proposed, a suitable locality is being selected for determining the efficiency of this measure of control alone.

2. The examination of all flies captured about the station and yards as regards sex and the number of eggs contained in the female, the identity of each species and date of capture being also recorded.

3. The examination of all carrion, the collection of all pupæ and maggots, and the study of their habits.

4. Examining all the sheep on the runs near the investigation camps when being put through the yards, and taking maggots from the living wool. Notes on the sexes where blown, and the identification of the flies bred out. Also the determination of the relative proportion of the different species present, with the object of ascertaining, if possible, which fly primarily blows the sheep.

5. Testing the effect upon blown sheep of different washes, dips, powders, and mixtures sent in for report by manufacturers, chemists, and inventors, care being taken to make the tests under conditions similar to those existing in the paddocks in which the sheep were running when blown.

6. Expert examination of the differences of clean and blown wool taken from sheep that have been treated with these mixtures to determine their action upon the wool.

7. Expert examination of clean and blown wool taken direct from the sheep.

8. Attraction and poisoning of the maggots and adult flies.

9. Examination by the Biologist and Microbiologist of fungus and bacterial diseases of the house fly and blow-flies, with a view to their application to fly destruction.

10. Shooting and examination of birds.

Official Milk and Butter Records.

RECORDS OF COWS THAT HAVE REACHED THE STANDARD OF THE UNITED PURE-BRED DAIRY CATTLE BREEDERS' ASSOCIATION'S HERD-TESTING SCHEME.

M. A. O'CALLAGHAN.

HEREWITH are records of representatives of five private herds and three Government herds. The outstanding features of the records are the high yields put up by three cows in Mr. MacDonald's Jersey herd and by one of Miss Walker's Jerseys.

Mr. MacDonald and Miss Walker are two breeders who feed their cows notably well, and there is no doubt whatever that systematic feeding, so as to prevent the cows going back in their yield at any time during the period of test, is quite half the battle in obtaining high results.

The continual publication of these records should make some of our farmers think whether it may not be more advisable for them to reduce the number of cattle in their herds, so as to be able to procure a greater quantity and a greater variety of food for each individual cow.

Herd-testing is only in its infancy in Australia, but breeders are gaining a great deal of knowledge from the results so far obtained.

Of course it is not possible to expect herds of the size of that of Mr. Gollan, of Woodburn, or Mr. Manning, of Bega, to be all hand-fed; consequently, such large breeders will always be at a disadvantage in the way of feeding when they enter all the cows in their herd for the test, as these two gentlemen have done.

Up to date, Mr. Gollan has entered 163 cows, and Mr. Manning 138.

Mr. O. H. Gollan's Jersey Herd at Woodburn.

Name of Cow and Herd book No.	Age at beginning of test.		Date of last Calving.	Total.		Yield on last day of test.	
				Milk.	Butter	Milk.	Butter.
	yrs.	mths.	1914.	lb.	lb.	lb.	lb.
Goolmangar Primrose I, 2052	5	0	18 Aug. ...	4,732	317	5·	·42
Statesman's Juanita, 3199 ...	2	0	21 July ...	3,529	214	5·	·31
Canary's Tiny	2	7	17 Aug. ...	3,978	210	7·	·40
Maitland's Silver Stream, 3193	3	0	8 July ...	4,035	249	11·25	·75
Canary's Kitty, 3172	2	5	12 ,, ...	3,433	206	5·	·38
Maitland's Purity, 3191 ...	1	11	18 Sept. ...	3,785	241	6·	·46
Maitland's Peggy Pride II, 3190	2	6	20 Dec. ...	3,975	242	11·	·79

Mr. J. Davies' Jersey Herd at Scone.

Name of Cow and Herd-book No.	Age at beginning of test.		Date of last Calving.	Total.		Yield on last day of test.	
				Milk.	Butter.	Milk.	Butter.
	yrs.	mths.	1914.	lb.	lb.	lb.	lb.
Captor's Coral, 3243	1	10	24 Feb. ...	4,353	250	13·	·77
Puen Buen Needle V, 3246 ...	1	11	7 Nov. ...	5,082	317	16·75	·95
Cluster, 913	7	0	12 June ...	6,526	342	13·50	·79
Needle III, 1262	5	9	12 ,, ...	5,794	373	12·50	·86
Puen Buen Velvet Fox, 3247...	2	0	10 April ...	5,632	315	14·75	·75
Melody, 580	8	0	18 ,, ...	5,706	336	15·75	·89
Puen Buen Merrythought II, 3244.	1	10	24 June ...	4,302	255	9·50	·53
Puen Buen Molly IV	2	0	2 July ...	5,154	271	11·50	·72
Jessie's Starbright, 1098 ...	6	1	28 Oct. ...	5,505	315	12·50	·86
Carrie's Fox, 896	6	0	27 ,, ...	6,501	394	8·57	·58
Vixen, 3248	2	7	15 Feb. ...	5,697	305	17·25	1·07
Marigold, 1195...	7	0	20 Nov. ...	5,326	311	15·75	·99

Mr. C. R. G. MacDonald's Jersey Herd at Ingleburn.

Name of Cow and Herd-book No.	Age at beginning of test.		Date of last Calving.	Total.		Yield on last day of test.	
				Milk.	Butter.	Milk.	Butter.
	yrs.	mths.	1914.	lb.	lb.	lb.	lb.
Brighton Lady, 3075	1	10	18 July ..	5,755	336	15·	·96
Brighton Zingara II, 3079 ...	2	10	29 ,, ...	9,253	561	22·5	1·99
Golden Lady, 1049	14	0	8 Aug. ...	5,893	379	13·5	·97
Exile's Brighton Queen, 3080..	1	9	17 Sept. ..	7,122	433	20·5	1·92
Maitland's Queen of St. Lambert, 3084.	2	11	6 Oct. ...	8,130	491	22·	2·04
Brighton Vanilla II, 3078 ...	3	2	20 ,, ...	10,701	629	38·	2·63
Coomassie, 917...	10	3	4 Dec. ...	8,773	528	18·5	1·31
Maitland Madeira, 3083 ...	2	1	2 ,, ...	4,840	289	13·5	·81

Miss E. C. Walker's Jersey Herd at Concord.

Name of Cow and Herd-book No.	Age at beginning of test.		Date of last Calving.	Total.		Yield on last day of test.	
				Milk.	Butter.	Milk.	Butter.
	yrs.	mths.	1914.	lb.	lb.	lb.	lb.
Fleur de Bois III, 3090 ..	2	5	15 Sept. ...	5,583	357	12·5	1·03
Fuchsia, 424	10	5	17 ,, ...	8,208	431	19·	1·11
Lux, 3094	2	11	19 ,, ...	7,043	389	17·	·91
Lydia, 3095	4	1	9 ,, ...	8,428	533	16·	1·13

Mr. A. L. Manning's Jersey Herd at Bega.

Name of Cow and Herd-book No.	Age at beginning of test.		Date of last Calving.	Total.		Yield on last day of test.	
				Milk.	Butter.	Milk.	Butter.
	yrs.	mths.	1914.	lb.	lb.	lb.	lb.
Boronia, 2820	3	4	11 Nov. ...	5,545	341	11·	·77
Guitar	5	2	23 ,, ...	5,329	320	12·	·83
Nada, 1257	5	2	17 Dec. ...	5,160	327	12·5	·73
			1915.				
Mother of Pearl, 2385 ...	3	3	13 Feb. ...	5,953	380	20·5	1·27
Judith II, 2832...	2	8	21 ,, ...	3,952	268	14·	1·01

New South Wales Government's Ayrshire Herd at Grafton Experiment Farm.

Name of Cow.	Age at beginning of test.		Date of last Calving.	Total.		Yield on last day of test.	
				Milk.	Butter.	Milk.	Butter.
	yrs.	mths.	1914.	lb.	lb.	lb.	lb.
Auchen Rose	7	9	1 June ...	7,584	337	19·	·96
Judith II	2	4	24 Sept. ...	5,757	293	15·5	·78
Trilby IV	3	8	24 June ...	6,159	315	13·	·83
Judith III of Wollongbar ...	2	3	24 Sept. ...	4,536	228	5·	·34
Saphron II	2	11	17 Oct. ...	4,705	233	12·	62
Mary of Argyle	3	11	22 ,, ...	5,460	273	10·	·60

New South Wales Government's Shorthorn Herd at Berry Experiment Farm.

Champion VII	3	3	30 Mar. ...	5,331	272	18·	1·14
Marchioness of Raleigh ...	4	0	6 April ...	6,748	328	19·	1·06
Dainty VIII	2	8	8 ,, ...	5,601	266	20·	1·06
Blanche	2	8	20 ,, ...	4,644	207	22·5	1·04
Blossom II	2	9	27 ,, ...	6,204	276	19·	·87
Charlotte II	2	9	30 ,, ...	5,118	230	20·5	1·09
Daisy VIII	2	8	9 June ...	6,928	302	22·	1·06
Easy	2	10	19 ,, ...	6,414	323	16·5	·90
Marchioness of Berry... ...	2	6	24 Nov. ...	4,380	208	9·5	·40

New South Wales Government's Holstein Herd at Berry Experiment Farm.

Double Dutch	3	3	25 April ...	6,993	297	7·5	·41
Boswe II	7	8	1 Aug. ...	6,973	303	18·	·76
Miss Muller	5	3	7 ,, ...	8,700	337	19·	·79
Berchem	6	8	14 ,, ...	8,836	334	21·	·78
Loltje Amster	8	5	27 ,, ...	8,469	360	13·	·68
La Hooke	2	3	22 Oct. ...	5,212	223	10.	·37

Cheese for Export.

MATTHEW WALLACE, Dairy Instructor.

In the production of cheese for export, the utmost care should be exercised in the selection of the milk. Weedy or faulty flavoured milk should on no account be used.

The judicious use of a good starter is invariably attended with good results, as it is necessary that the proper degree of acidity be developed in the milk before the rennet is added.

If colouring is used, it should be added at least fifteen minutes before the milk is ready for renneting, and from 1½ to 2 oz. of colour per 100 gallons of milk, will give the desired colour.

Sufficient rennet should be added to give a firm coagulation in about forty minutes.

After cutting the curd—which is best performed with knives having blades ⅜ inch apart—the cooking is begun.

In cooking the curd, extreme temperatures should be avoided—98 to 100 deg. Fahr., is generally sufficient—but the curd must be stirred until it is firmer than is usually the case with loaf cheese intended for the local market.

On no account should an excess of acid be allowed to develop before the whey is run off. Sufficient acid will be present if the curd draws from ⅛ to ¼ inch on the hot iron.

The acidimeter test varies with different classes of milk, but will generally be from ·16 to ·18 at this stage.

In cheddaring, some makers prefer the use of racks, while others adopt the pan system, but whichever method is adopted the process should be complete, and will generally take about two hours before the curd is ready for milling.

After milling, thorough æration should take place, and the curd allowed to mellow properly before adding the salt.

The temperature of the curd at salting should not exceed 90 deg. Fahr.

From 2¼ to 2¾ lb. of salt should be added to every 100 lb. of curd. The salt should be sifted through a fine wire sifter, and the curd stirred thoroughly to mix the salt.

The full quantity of salt should not be added at one application, as this hardens the outside of the pieces of curd and prevents proper absorption.

After salting, the curd should be stirred and the salt allowed to thoroughly penetrate the curd before hooping. In about twenty minutes after salting, the curd may be hooped. The temperature of the curd when put to press should not exceed 85 deg. Fahr., and should not be under 80 deg.

The addition of scale boards to the ends of the cheese, is a great advantage, and prevents them sticking to the crates.

Pressing should be continued for two days, and particular attention paid to the trimming and finish of the cheese.

It is of the utmost importance that cheese intended for export should not be overheated in the curing room, otherwise damage is done which no amount of subsequent cold storage can repair.

The cheese may be crated and shipped when from two to three weeks old.

Cheeses for export should weigh, approximately, 80 lb. each, and be packed two in a crate. This is the class of cheese most favoured on the English market.

If coloured, the colour of the cheese should be distinct. There is, however, a greater demand for uncoloured cheese, the latter generally realising several shillings more per cwt. than coloured cheese.

It would be advisable for makers to send two-thirds of their cheese uncoloured and one-third coloured.

The brand and the weight of the cheese should be clearly branded on each end of the crate. In addition, the letter C should be branded on coloured cheese crates, and U on uncoloured.

If these precautions are omitted, much unnecessary boring of the cheese by prospective purchasers is the result.

New crates, made with ten or twelve battens, should be used, and the ends wire-bound; hoop-iron is not favoured.

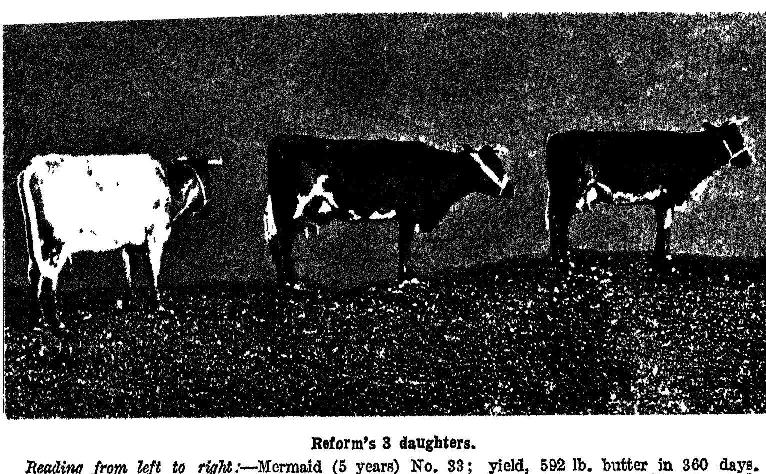
The greatest care should be exercised in keeping the crates as clean as possible, in order to make the whole parcel look more attractive.

The Judging of Dairy Stock on Points for Production, Constitution and Type.

In the November issue extensive reference was made to the results of the adjudication of both bulls and cows at the Bangalow Agricultural Society's Show in March, 1915, under a new scheme in which production was taken into account as well as constitution and type. The accompanying illustrations depict some of the prizewinners at the Show. For further details, readers are referred to the article on page 965 in our last issue.

Reform.

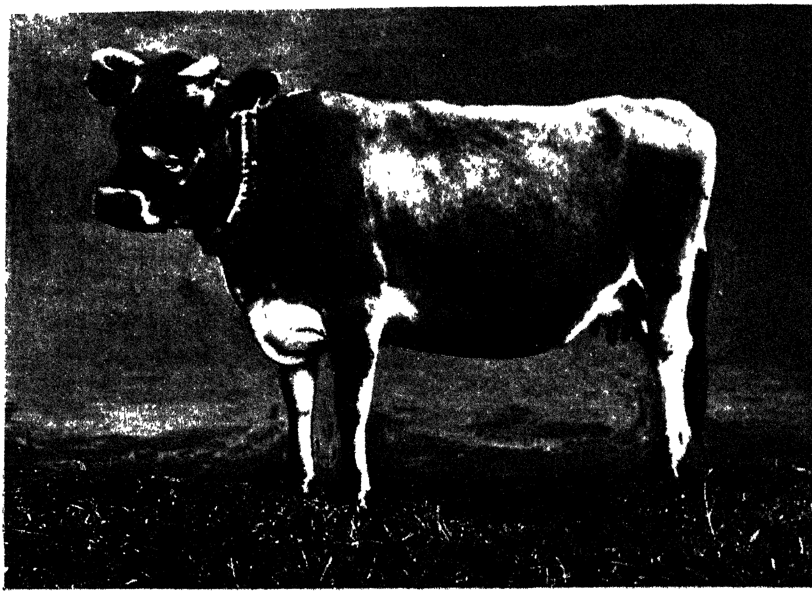
1st Prize in Class of Bulls of 6 teeth and over on production of three daughters. Bangalow, 1



Reform's 3 daughters.

Reading from left to right:—Mermaid (5 years) No. 33; yield, 592 lb. butter in 360 days. Star (3½ years) No. 25; yield, 460·2 lb. butter in 360 days, and Emerald (2¾ years) No. 63; yield, 359·4 lb. butter in 360 days.

THE JUDGING OF DAIRY STOCK ON POINTS FOR PRODUCTION, CONSTITUTION, AND TYPE.



Acrasia, No. 807 A.J.H.B.

1st Bangalow, 1915, as cow over 6 teeth, judged on production and points. Yield, 401 lb. butter in 273 days; pedigree: sire, Coomassie, by Laddie Coomassie (imp); dam, Acrasia II. by Silver King by Sir Harry; g. dam, Acrasia I. by Young Khedive by Khedive 450 by Lucius (imp) 470.

Empress, No. 42.

First in class over 6 teeth; yield, 720 lb. butter in 360 days. Age 7 years. Pedigree: by Bruce of Burradale ex Queen of Burradale by Commodore (a descendant of bull known as H. Frederick's "Major") ex Princess, grand-daughter of Emperor, a grandson of Evan Evan's "Major."

THE JUDGING OF DAIRY STOCK ON POINTS FOR PRODUCTION, CONSTITUTION, AND TYPE.

Prickly Pear as a Food for Dairy Cattle.

M. A. O'CALLAGHAN.

THE American Department of Agriculture has carried out an exhaustive trial on the feeding of prickly pears to dairy cows, both as part of a ration and as a sole ration for dairy cattle. The prickly-pear used for the trials was obtained from cultivated plots on the Experiment Farm at Brownsville, Texas.

The experiments show that for the majority of cattle prickly-pear may be used largely as a portion of the daily ration of dairy cows. It was also shown that cows can be kept alive on prickly-pear alone for a long time, though, of course, it is not a satisfactory ration.

Considering the extreme droughts from which Australia suffers every now and then, the question of utilising prickly-pear at such periods is well worth consideration, and the trials referred to are, therefore, of considerable importance to us. Of course, numbers of people in Australia have used prickly-pear to some extent in times of stress, but nothing in the nature of a large experiment has been attempted.

During a severe drought on the Hunter River about ten years ago, the late Sylvester Browne, who then lived at Minembah, near Singleton, fed a large dairy herd mainly on prickly-pear for quite a long time. He first singed the pears to remove the thorns, and then distributed the food to the cows in the paddocks. One time, when riding with Mr. Browne through a part of the run, I drew attention to the presence of prickly-pear here and there, and he informed me that he did not desire to destroy it, as it appeared to make very little headway on his property, and the little there was of it he regarded of value to him as a stand-by in case of drought.

It is quite possible that with thorough organisation a number of the stock that died during the recent drought in Victoria and New South Wales could have been saved by the feeding of prickly-pear on economic lines.

One of the problems in connection with the use of prickly-pear as a fodder would be that of transit, and the question to be solved in connection with this is, whether it would be an economic possibility to remove a considerable portion of the moisture from the pears where grown, and afterwards ship the dry or partially dry fodder. The question is worthy of consideration, and hence I submit the summary of the experiments conducted by the United States Department of Agriculture:—

SUMMARY.

The average analysis of prickly-pear fed in these experiments was as follows: Water, 91·30 per cent.; crude protein ($N \times 6·25$), 0·58 per cent.; albuminoid protein, 0·29 per cent.; ether extract, 0·12 per cent.; nitrogen-free extract, 4·67 per cent.; crude fibre, 1·16 per cent.; ash, 1·76 per cent.

Prickly-pear was found to be a very palatable feed for dairy cows, even when it formed the major part of the roughage ration, and 100 to 150 pounds were consumed per cow per day.

The prickly-pear ration caused an increase in the quantity of mik produced, a decrease in the percentage of fat in the milk, and a decrease in the total production of fat. The reduction in the percentage of fat became more pronounced as the quantity of prickly-pears in the ration increased.

Assuming the feeds to have these percentages of dry matter—Prickly-pear, 10; sorghum hay, 80; sorghum silage, 25; and cotton seed hulls, 90;—and considering the nutritive values to vary in direct proportion to the contents of dry matter, 1 lb. of sorghum hay was equal to 15·9 lb. of prickly-pear, when that plant was fed in large quantities, and to 10·1 lb. of prickly-pear when it was fed in moderate amounts. One lb. of sorghum silage was equal to 2·6 lb. of prickly-pear, and 1 lb. of cotton seed hulls was equal to 5·8 lb. of prickly-pear.

When prickly-pear in moderate amounts was substituted for a part of the dry roughage, it appeared to have little effect on the digestion of the other ingredients of the ration; when substituted in large amounts it depressed the co-efficient of digestion, although not to any great extent.

As the result of maintenance trials conducted during these experiments, it is believed that mature Jersey cows can be maintained on a daily ration of 3·5 to 6 lb. of sorghum hay, 60 to 100 lb. prickly-pear, and 1 lb. of cotton seed meal a day; or with prickly-pear as the sole roughage, about 110 lb. of that plant and 2 lb. of cotton seed meal. Prickly-pear alone did not make a satisfactory maintenance ration, but sustained life for a long time. One cow that was fed prickly-pear alone for a period of seventy days lost 30·2 lb. live weight.

The average co-efficients of digestion in two trials with prickly-pear as the sole ration were as follows:—Dry matter, 61·58; ash, 38·37; crude protein, 71·56; crude fibre, 42·98; nitrogen-free extract, 71·55; ether extract, 65·88; organic matter, 67·21.

Palatability was apparently an important factor in feeding prickly-pear as the sole roughage. One cow that ate prickly-pear with relish did as well on the ration when that plant was the sole roughage as when some dry roughage was included. Another that reluctantly ate prickly-pear lost in weight. In one case feeding prickly-pear alone caused the formation of an obstruction in the intestine and the death of the animal.

The feeding of prickly-pear produced a highly coloured butter, but had no appreciable effect upon the flavour or keeping quality of the milk.

Prickly-pear had a decidedly laxative effect on the cows, although there seemed to be no permanent ill effects even after long continued feeding. The addition of common salt (sodium chloride) to a ration of prickly-pear even when added in large amounts, 4 to 6 ounces per day to each cow, had no appreciable effect upon the laxative property of the plant.

During an experimental period of ten days, cows receiving a heavy ration of prickly-pear drank no water, those receiving a medium ration drank an average of 44·3 lb. of water per day, while those on a roughage ration of sorghum hay drank a daily average of 95 lb.

As measured by milk production cows fed prickly-pear were more sensitive to "northers" than those which received a dry roughage. The greater the quantity of the plant consumed the more sensitive the animal became.

The prickly-pear ration appeared to have no great influence upon the size and vigour of the offspring, or upon the condition of the cow after parturition.

The cost of harvesting prickly-pear depends largely upon local conditions. During these experiments it was found that the spines could be singed at a cost of about 50 cents per ton.

There was no great difference between the spineless and the spiny varieties of prickly-pear in composition, palatability, or feeding value. While the cost of harvesting the spineless was less than that of the spiny varieties, the latter yielded a greater tonnage to the acre at Brownsville, Texas, and were not so subject to injury from insects. The spiny varieties are hardier, and can be grown in a much greater area than the spineless.

These experiments were conducted for periods long enough to show conclusively that prickly-pear is a good and palatable feed for dairy cows. It is best to feed the plant in medium quantities, 60 to 75 lb. a day to each cow. When fed in large amounts, 120 to to 150 lb. a day, it causes an excessive scouring, and a very insanitary condition of the stable. On account of the high content of mineral matter, it is thought that prickly-pear may be of special value as a supplementary feed for use with other roughages of a low mineral matter content, such as cotton seed hulls.

A Descriptive Catalogue of the Scale Insects ("Coccidae") of Australia.

[Continued from page 764.]

WALTER W. FROGGATT, F.L.S., Government Entomologist.

Genus XXIX.—*Cerococcus*, Comstock.

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Cerococcus, Comstock, *Report U.S. Dep. Agriculture*, p. 213. 1882.
Cerococcus, Scott, *Trans. Linn. Soc., London*, vol. ix, p. 445. 1907.
Cerococcus, Green, *Coccidæ of Ceylon*, part iv., p. 305. 1909.

THE female coccids of this genus form curious waxy tests, sometimes covered with tufts and spiny projections of secretion, produced at the anal extremity into a short tube surrounding the apical opening.

Green says: "Adult female insect with the terminal abdominal segments usually abruptly narrowed. The extremity with two stout spiniferous lobes, each bearing a longish seta; the interno-ventral aspect of the lobes more densely chitinous; a prominent median triangular plate on the dorsal aspect; anal ring with eight stout hairs; antennæ rudimentary. Limbs rudimentary or absent. Mentum dimerous. Derm with conspicuous paired (8-shaped) glands. Cribriform plates present in the dorsal surface of the abdomen. No stigmatic spines.

Male puparium with a large oval or circular operculum above the posterior extremity."

This is a small genus, the members of which are described from California, Mexico, India, Ceylon, New Zealand, and Australia. In Mrs. Fernald's catalogue four species are listed, but with the addition of Green's species from Ceylon and the new ones here described from Australia, the members of the genus are more than doubled.

Cerococcus auranticus, n.sp. (Plate XIX, fig. 1.)

This beautiful species was originally discovered by me at Bando Station, near Gunnedah, New South Wales, upon the twigs of the native blackthorn (*Busaria spinosa*); since then they have been found at Lakemba, near Sydney, on the same shrub. This coccid was determined by Mr. E. E. Green.

Test of adult female formed of a stout coat of reddish orange waxy secretion with the funnel-shaped apical tube, spots on surface, and four spine-like tufts pale yellow. General form broadly oval, tapering on the hind margin, where it is produced into a circular tube round the anal opening. Length, $\frac{1}{10}$ of an inch.

Male tests scattered about among the female tests, pale, bright yellow, mottled with red, elongate, rounded in front, cylindrical or slipper-shaped, with the hind portion truncated, with a pale yellow flap. Length, $\frac{1}{20}$ of an inch.

Adult female dark reddish-brown, broadly oval, with the anal segment divided, either side produced into a stout blunt lobe bearing one very long hair and several shorter ones. The anal ring with eight or more flattened hairs and the dark chitinous anal plate below forming a half circle almost enclosing it. Antennæ aborted into two blunt horns; legs wanting, epidermis thickly covered with both large yellowish, and smaller semi-transparent, figure-of-eight processes, and many other small circular pores or glands Length, $\frac{1}{10}$ of an inch.

Cerococcus bryoides, Maskell. (Plate XIX, fig. 2.)

Planchonia bryoides, *Trans. N. Zealand Institute*, vol. xxvi, p. 84. 1893, and vol. xxix, p. 315. 1897.
Asterolecanium bryoides, Cockerell, *Bull. Illinois State Laboratory*, vol. iv. 1896.

This species was described from specimens upon the bark of an undetermined plant received by Maskell from Fiji. Later on he received specimens from New South Wales upon the twigs of the native cherry (*Exocarpus cupressiformis*), which he described under the varietal name of *stellata*, but did not seem to consider it even a well defined variety. I have found it upon the stems of a plant *Helichrysum diosmifolium* at Mittagong, New South Wales. Mr. C. T. Musson obtained it at Richmond (Hawkesbury College) upon broom.

Test of adult female formed of dull yellowish secretion, but so thickly covered with secretionary matter forming grey tufted filaments that it gives it a greyish brown tint; irregularly oval, convex, with a large anal opening on the hind margin. Length, $\frac{1}{10}$ of an inch.

Male test pale yellow, semi-transparent, sometimes with a greyish tint, finely granulated, elongate oval, slipper-shaped, round in front, with the hind portion truncate. Length about $\frac{1}{5}$ of an inch.

Adult female dull yellow, broadly oval, with the anal segment elongated, rounded to apex, slightly cleft, with the anal lobes bearing a long bristle or seta. Maskell calls the anal segment a short conical "tail," and the whole female of a peg-top shape. The anal ring and anal plate dull yellow chitinous, former bearing short hairs. Derm thickly covered with figure-of-eight orifices, of two sizes. Legs and antennæ wanting. Length, $\frac{1}{8}$ of an inch.

218. *Antecerococcus bryoides*. Cat. Coccidæ, p. 58.

Cerococcus punctiferus, Green. (Plate XIX, fig. 3.)

Antecerococcus punctiferus, Pro. Linn. Soc., N.S. Wales, p. 560, vol. xxv, pl. xxxiii, figs. 3-9. 1900.

This species was described from specimens obtained at Bathurst, New South Wales, upon the stems of a garden shrub, *Pittosporum eugenioides*.

In January, 1903, I visited and fumigated a pittosporum hedge in a garden at Nowra, New South Wales, that was very badly damaged by this coccid, every twig being so thickly encrusted with the tests that one could hardly define the individual specimens. The female tests in these examples were much more thickly covered with the glassy white filaments than the typical forms.

Adult female enclosed in a stout covering of granulated waxy secretion of reddish colour, with four tufts of pale glassy white filaments, two large ones on each side, with smaller tufts behind. Broadly rounded with the hind portion tapering round the anal opening.

Male tests slipper-shaped, of a more yellow tint, mottled with pale red, front rounded, the hind portion truncate sloping downward. Length, 1·25 mm.

Adult female irregularly oval (treated in potash, pyriform), the abdomen terminating in a pair of conical lobes each furnished with a long seta and several smaller spines on the sides; anal ring with eight stout flattened hairs. Antennæ and legs rudimentary. Derm covered with figure-of-eight pores, of two sizes, the larger ones grouped in definite spots, also bands of small circular pores. Length, 1·25 to 1·50 mm.; breadth (across thorax), 1 mm.

219. *Antecerococcus punctiferus.* Cat. Coccidæ, p. 58.

Cerococcus pyriformis, n.sp.

The female tests were thickly encrusting the branchlets of an undetermined small-leaved, spiny shrub growing in the Parkes district, New South Wales (D. Ploughman).

The female tests, pear-shaped, with the ventral surface flattened against the bark, forms an almost complete sack of pale yellow granulated waxy secretion, fringed with beautifully glassy filaments. The anterior portion forms a short rounded tube with an irregular anal opening at the tip. Length about $\frac{1}{16}$ of an inch, slightly longer than broad.

Adult female dark reddish-brown, when boiled in potash, showing a pear-shaped form, which is lost when mounted. Antennæ, and legs aborted, epidermis covered with figure-of-eight pores running in rows, with other single scattered pores. Anal segment produced into two small lobes each bearing a slender hair, with a short spine-like hair on either side of each lobe. The anal ring close to the lobes, with a small anal plate, and a ring of six hairs. This handsome species agrees with Green's definition of the genus, the test having the typical form, with the addition of the delicate fringe along the outer margin found in the members of the genus *Asterolecanium*. There may be eight hairs on the anal ring, but I can only make out six.

Genus XXX, *Kermes*, Boitard.

Manual d'Entomologie, p. 171. 1828.
Targioni-Tozzetti, *Catalogue*, p. 40. 1869.
Signoret, Ann. Soc. Ent., France (5), vol. iv., p. 547. 1874.
Cockerell, *Canadian Entomologist*, vol. xxxi, p. 276. 1899.
Newstead, *Mon. British Coccidæ*, vol. ii, p. 138. 1902.

The adult females of this genus are berry or gall-shaped insects that have more or less well developed legs and antennæ (with a few exceptions, as in *Kermes acaciæ*.) They are naked, or lightly covered with secretion, the antennæ consisting of not more than six joints. The anal ring is not fringed with hairs, and the anal tubercles are wanting or are very inconspicuous.

The male coccid forms a felted sac or puparium. The larvæ have well developed anal lobes. Newstead has figured the British species. It is from several species of this genus that the valuable commercial colouring matter is obtained.

Twenty-seven species have been described from Europe and North America, all of which are found upon oak trees. The single species described from Australia is found upon an *Acacia*.

Kermes acaciæ, Maskell.

Trans. N.Z. Institute, vol. xxvi, p. 83, pl. iv, figs. 15-18. 1893.

The type specimen was collected by Mr. Olliff upon the twigs of a wattle (*Acacia* sp.) near Sydney. I have no other record of this rare coccid.

Adult female dark red, almost globular in form, with a small opening beneath. Antennæ and feet wanting. Abdominal cleft only distinguished by a small cleft on the edge of the basal orifice, forming a narrow depression along the dorsum to a black spot, where there is a small opening and two very small lobes. The epidermis is wrinkled, after treatment in potash, showing great numbers of a small conical pointed pustules. Diameter of coccid $\frac{1}{5}$ of an inch. Maskell describes the typical larva and considers this species comes nearest to *Kermes vermilio*.

232. *Kermes acaciæ*. Cat. Coccidæ, p. 60.

Genus XXXI.—*Rhizococcus*, Signoret.

Ann. Soc. Ent. France (5) vol. v, p. 36. 1875.
Maskell, *Coccidæ of New Zealand*, p. 96. 1887.
Cockerell, *Canadian Entomologist*, vol. xxxi, p. 276. 1899.

Though the original type for this genus was described by Dr. Signoret from France upon the roots of a daphne, all the other species, with one exception, are found upon twigs and foliage, and fourteen of the sixteen listed are described from New Zealand and Australia, while Green has recently described two more from Australia. From a study of a good deal of live material I think that with further investigation several of the species described upon the Casuarinas as distinct will be found at the least to be only varieties. Maskell defines the genus as follows: "Adult female naked, usually stationary, body segmented; anal tubercles conspicuous. Antennæ of six or seven joints. Feet present. Anogenital ring inconspicuous with fine hairs. Male pupa enclosed in a cottony sac."

Rhizococcus bicolor, n.sp.

This species was collected upon the foliage of a myall (*Acacia* sp.) by Mr. L. J. Newman at Dowering, West Australia.

Adult female blackish purple with yellowish markings, broadly oval, very much wrinkled, and cleft on the under surface when resting on the fine branchlets; segmental divisions evidently well defined when alive. Length about $\frac{1}{7}$ of an inch.

Antennæ six-jointed, first short angulated, second shorter than third, fourth shorter than third, fifth about the same length, sixth twice as long as the last two combined; rounded at the extremity with scattered hairs on sides. Legs stout, tibia slender, tarsus with four hairs on sides, digitules long slender hairs curled and slightly thickened at the tips. Anal lobes represented by two chitinous areas with a group of short blunt spines. Anal ring large with six long hairs. Epidermis covered with circular pores and short hair-like spines.

Rhizococcus casuarinæ, Maskell.

Trans. New Zealand Institute, vol. xxv, p. 230, pl. xv, fig. 7. 1892.
The Entomologist, vol. xxvii, p. 46. 1894.

This coccid was found at Myrniong, Victoria, upon the branchlets of a she-oak (*Casuarina suberosa*), and at Cheltenham, Victoria, on *Casuarina distyla* (French).

The adult female varies in colour from yellow to dark red; the form normal, with slight segmentation. Length about $\frac{1}{8}$ of an inch. Antennæ six-jointed, of which the third is as long as the rest combined. Feet normal. Anal tubercles hidden before treatment with potash. Dorsum bearing some slender spines, some of which are very long. Maskell says: "This is another species allied to *R. grandis*, but it appears to differ from that sufficiently in the antennæ, and principally in the rows of very strong spines on the dorsum of the larva." In his plate he figures the larva.

261. *Rhizococcus casuarinæ*. Cat. Coccidæ, p. 66.

Rhizococcus grandis, Maskell.

Trans. N. Zealand Institute, vol. xxiv, p. 29, pl. vi, figs. 1-2, 1891, vol. xxv, p. 230. 1892.

This is an underground species found upon the roots of a wattle (*Acacia longifolia*) in Victoria.

Adult female dark-red, naked, convex, and subglobular in form, with distinct segmental divisions. Maskell says: "This very large insect has much the appearance to the naked eye of *Coccus cacti* (the cochineal insect), being very much the same size and colour. Length about $\frac{1}{3}$ of an inch.

Antennæ composed of six joints, the second longest, first, third, and sixth shorter about the same length; fourth and fifth the shortest; on the terminal one, several short hairs. Feet slender, tibia with spine, upper digitules fine hairs, lower pair slightly dilated. Anal ring with eight hairs, on the dorsum scattered slender hairs."

Maskell described another form from the same locality on an allied wattle (*Acacia implexa*), which he called var. *spinosior*. The differences were the more numerous dorsal spines and the lower pair of digitules more dilated. He does not state in his description if this variety is a subterranean one like *R. grandis*.

265. *Rhizococcus grandis*. Cat. Coccidæ, p. 66.

Rhizococcus lecanioides, Green. (Plate XIX, fig. 4.)

Bull. Entom. Research, vol. vi, pt. 1, p. 47, fig. 4. 1915.

This curious species is found upon the branchlets of a she-oak (*Casuarina distyla*) at Sandringham, Victoria (French).

Adult female dark-brown; smooth, without any defined segmentation, variable in form, convex and pear-shaped; others shaped like small cowrie shells, with the margin of the under-surface curled on to the branchlets. Antennæ and legs very small; the joints of the antennæ very indistinct, apparently six-jointed, third longest. Tarsus very long. Anal lobes large, prominent, chitinous and wrinkled, with a short seta on each lobe. Derm without spines, but thickly set with small oval chitinous lenticels. Anal ring with eight stout seta. Length about $\frac{1}{12}$ of an inch. (Abridged from Green's description.)

Rhizococcus lidgetti, Cockerell.

Victorian Naturalist, vol. xvi, p. 88. 1899.

This species was collected on the twigs of a wattle (*Acacia estrophiolata*) at Myrniong, Victoria.

"Female coccids on twigs, very dark purple, naked even when full of young. Boiled in caustic soda they give out a fine magenta colour; the female boiled and flattened out under a cover glass is 4 mm. long and $2\frac{1}{2}$ broad. Mouth parts very small. Legs and antennæ very pale. Dermal spines numerous."

It differs from all the other Australian species in having seven-jointed antennæ and in a few minor details.

267. *Rhizococcus lidgetti*. Cat. Coccidæ, p. 67.

Rhizococcus lobulatus, Green. (Plate XX, fig. 1.)

Bull. Entom. Research, vol. vi, pt. 1, p. 46, fig. 3. 1915.

This curious coccid is not uncommon on the foliage of the "Weeping Myall" (*Acacia pendula*), one of our most graceful western scrub trees. I have it originally from Bramble Station, near Condobolin, New South Wales; it was sent to Mr. Green in 1901. Other localities where it has been found are Parkes, Yanco, and Forbes.

The adult females naked, dark reddish brown with a few white woolly filaments under the anal portion, resting stationary on the leaf or twig; broadly oval, convex, wrinkled, tapering slightly to the anal extremity and showing segmental divisions on the apical portion. Length about $\frac{1}{8}$ of an inch.

Fig. 1.—*Cerococcus auranticus.*

Fig. 2.—*Cerococcus bryoides.*

Fig. 3.—*Cerococcus punctiferus.* Male tests.

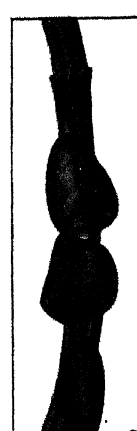

Fig. 4.—*Rhizococus lecanioides.*

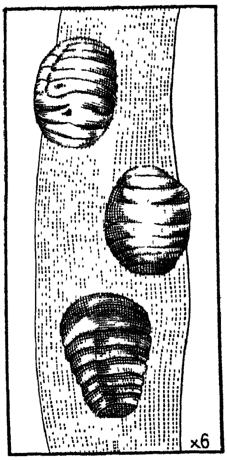

Fig. 1.—*Rhizococcus lobulatus*, n.sp.

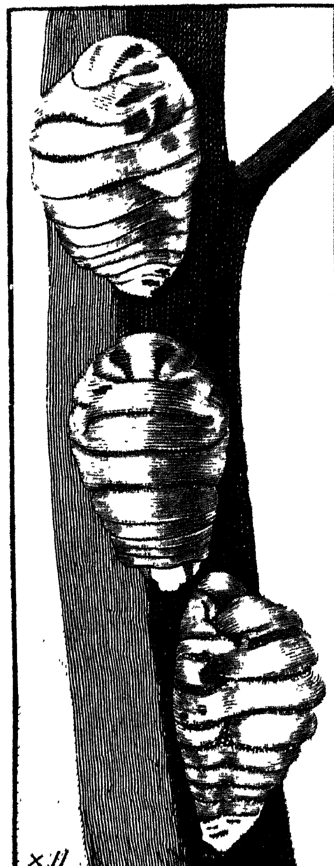

Fig. 3. *Rhizococcus viridis*

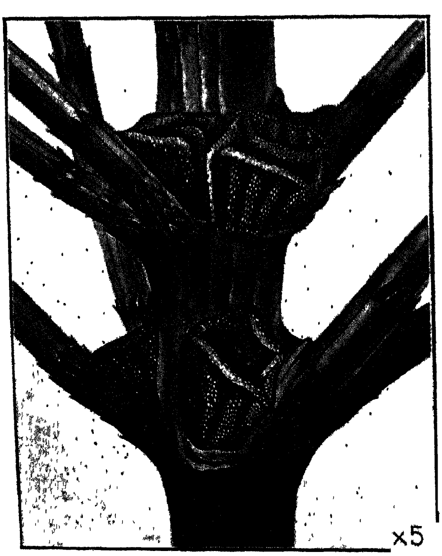

Fig. 2.—*Rhizococcus mancus*.

Fig. 4.—*Gossyparia syncarpiæ*, n.sp.

Antennæ with six joints, fifth shortest, sixth longest. Legs small, but stout; claw stout. Anal lobes forming eight prominent projections, the median pair longest; anal ring with six hairs. Epidermis covered with circular pores and short spiny hairs.

Rhizococcus mancus, Maskell. (Plate XX, fig. 2.)

R. casuarinæ, var. *mancus*, *Trans. N. Zealand Institute*, vol. xxix, p. 316. 1897.

This is a typical form of the species of this genus affecting the axils of the different species of she-oaks (*Casuarina*) in our coastal districts. It was originally described from specimens collected at Manly, New South Wales, upon *Casuarina distyla*. I have it upon an undetermined species of *Casuarina* growing at Wagga, New South Wales, and have examined many living specimens.

The adult female is found on the surface of the bark, but finally attached in most cases to the branchlet at the junction of the smaller twigs. General colour bright red, interspersed with small white dots, markings of brown, black or grey, changing to dull green on the flattened dorsal surface and sides; the whole covered with fine short scattered white spines. Dorsal surface flattened, with a slightly raised rim or ridge on either side with six rows of three deep punctures or pits, covering the dorsal area. The sides flattened with apparently the same number of rows of more irregular pits. Ventral surface angular, thus giving the whole coccid a wedge-like shape. Length $\frac{1}{5}$ of an inch, width on flattened surface $\frac{1}{8}$ of an inch.

In specimens resting on the surface of the bark not constricted by the angle of the twigs the under-surface is slightly concave and the upper surface convex with two transverse carinæ and similar depressions.

Antennæ six-jointed, first and second short, third large long, longer than the fourth, fifth, and sixth combined. Legs moderate, tarsus long. Anal segment rounded on either side, distinct, curled under the coccid. Epidermis covered with fine spiny hairs.

Larva resting in the cavity under the abdomen caused by the tip of the abdomen turning downward. Colour bright red with the legs and antennæ lighter; front rounded, tapering to the tip of the abdomen, with the dorsal surface bearing rows of fine white spines, the outer one forming a regular fringe, anal tubercles with a long white seta.

Rhizococcus pustulatus, Maskell.

Trans. N. Zealand Institute, vol. xxv, p. 231, pl. xv, figs. 8–9. 1892.

This species is another sent from Myrniong, Victoria, upon the branchlets of a she-oak (*Casuarina* sp.)

It has the general form of *R. casuarinæ*, but the adult female has no legs. "Dark-red, convex, sub-elliptical and tapering somewhat posteriorly; the dorsum exhibits two longitudinal grooves on the upper surface and two others

more shallow near the margins, and in these grooves are some rather long shallow depressions or pits; the epidermis is rough with great numbers of very minute pustules. Length of insect about $\frac{1}{15}$ in. Anal tubercles small, but conspicuous. Antennæ short with six joints, of which the fourth and fifth are shortest. Feet absent. Anogenital ring with eight hairs. Mentum dimerous. The dorsal pustules are very noticeable after treatment with potash."

Allied to *R. casuarinæ* and *R. grandis*, but besides being legless is distinguished by the dorsal corrugations, shallow pits and minute pustules.

270. *Rhizoccocus pustulatus.* Cat. Coccidæ, p. 67.

Rhizococcus tripartitus, Fuller.

Journal West Australian Dep. Agriculture, vol. iv, p. 1345. 1897.
Trans. Ent. Soc., London, p. 443. 1899.

This species comes from Western Australia, found upon the axils of the branchlets of the she-oaks (*Casuarina*, sp.)

According to Fuller's description this species is very closely allied to, if not identical with, one of Maskell's species *R. mancus*, which he considers a variety of *R. casuarinæ*. I think that these three are probably only the same coccid under different surroundings, for when upon the axils of the branchlets of the *Casuarina* it becomes wedge-shaped, as in the typical *R. mancus* and *R. tripartitus*, when upon the side of the branchlet it is more a convex wrinkled coccid as in the typical *R. casuarinæ*. I can find both forms of adult female coccid in the examination of a large series of fresh species of *R. mancus*, but the wedge-shaped form is the common one in the *Casuarina*. The colouration is also variable in a large series.

273 *Rhizococcus tripartitus.* Cat. Coccidæ, p. 67.

Rhizococcus viridis, Green. (Plate XX, fig. 3.)

Pro Linn. Soc., N.S. Wales, vol. xxv, p. 559, pl. xxxvii, figs. 1-3. 1900.
Froggatt, *Agri. Gazette, N.S. Wales*, vol. vii, p. 20. 1902.

The type specimens were found scattered over the young foliage and twigs of the Black Wattle (*Acacia decurrens*) growing at Mittagong, New South Wales Mr. T. MacCarthy has since collected it upon *Acacia prominens* at Lakemba, near Sydney. I noted it in my list of "Insects of the Wattle Trees."

Adult female when alive deep green, changing at death to a dull purplish brown with a little white meal on the dorsal surface. Length about ⅛ of an inch. Elongate oval, very convex, tapering slightly to the anal segment; concave beneath, with the margins curved in when attached to a twig. Antennæ six-jointed, basal one short, broad, somewhat angular, last one longer than the fourth and fifth combined, with the extremity round and with a few scattered hairs. Legs short stout, tarsus nearly as long as tibia. Digitules fine hairs (according to Green), but in my specimens the tips seem to be

curled round and slightly thickened. Anal ring with six hairs. The outer margin of the last two abdominal segments on either side of the anal tubercles rounded and furnished with stout spiny hairs; the anal lobes rounded, projecting, chitinous, dull yellow with short stiff spiny hairs. Epidermis with many fine circular pores and long sharp spines.

274. *Rhizococcus viridis.* Cat. Coccidæ, p. 66.

Genus XXXII.—*Gossyparia*, Signoret.

Ann. Soc. Ent., France (5) vol. 5, p. 20. 1875.
Maskell, *Trans. N. Zealand Institute*, vol. xxii, p. 227. 1892.

In this genus the adult female, though naked, rests upon and is surrounded with a pad of white cottony secretion so that only her dorsal surface appears to be naked, but when dead is easily detached from the surrounding secretion. The feet and antennæ are well developed. The typical form is the elm tree scale (*Gossyparia spuria*), common in Europe and North America.

This in point of numbers is a small genus containing only six described species, three of which are peculiar to Australia, one from New Zealand, another on the *Tamarix* in Asia Minor, Northern Africa, and Eastern Europe, and the Elm-tree scale.

Gossyparia casuarinæ, Maskell.

Trans. New Zealand Institute, vol. xxv, pl. xiv, figs. 12–13. 1892.

Specimens of this species were collected upon the branchlets of an undetermined species of *Casuarina*, near Sydney, New South Walës.

Adult female varying from dark to light brown, elliptical, convex, elongated, resting upon a cushion of woolly secretion with the back uncovered. Length about $\frac{1}{12}$ of an inch. Antennæ six-jointed, the third longest, the fourth and fifth the shortest. Feet with the tarsus longer than the tibia; digitules fine hairs. Anal tubercles distinct. Mentum dimerous. The margin of the body fringed with close slender spines.

Maskell says: "The cushion of grey cotton in this species is more scanty than is usual in this genus, almost the whole insect being exposed instead of only the dorsum as is ordinary.

275. *Gossyparia casuarinæ.* Cat. Coccidæ, p. 68.

Gossyparia confluens, Maskell.

Trans. New Zealand Institute, vol. xxv, p. 227, pl. xiv, fig. 4. 1892.

This species was also sent to Mr. Maskell about the same time as the previous one, from near Sydney, New South Wales, found upon an undetermined species of *Eucalyptus*.

The adult females produce a mass of white cottony secretion, sometimes tinged with yellow, upon the twigs of the gum tree, in which a number are enveloped but not hidden in the confluent mass of filaments. The naked

female is dark-red, convex, elongate oval, antennæ six-jointed, first three longest, of equal length. Feet rather long, tarsus longer than tibia. Anal tubercles well defined. Epidermis covered with fine slender spines, anal ring with eight hairs.

277. *Gossyparia confluens.* Cat. Coccidae, p. 68.

Gossyparia syncarpiæ, n. sp. (Plate XX, fig. 4).

I collected this species upon the foliage of the Turpentine gum (*Syncarpia laurifolia*) near Gosford, New South Wales, where it was very plentiful. This species was determined for me by Mr. E. E. Green some years ago.

The adult female rests upon a cushion of cottony secretion, in which she is encircled, but the greater part of the dorsal surface is exposed. General colour dull purplish-black, convex, broadly rounded, tapering slightly to the tip of the abdomen, with the segmental divisions well defined. Length about $\frac{1}{10}$ of an inch. Antennæ with six joints.

(To be continued.)

Seed Testing for Farmers.

The Department is prepared to test vegetable and farm crop seeds. Reports will be given stating the germination capabilities of the seed, its purity, and the nature of the impurities, if any.

Communications should be addressed to the Director, Botanic Gardens, Sydney. Not less than 1 ounce of small seeds such as lucerne, or 2 ounces of large seeds like peas, should be sent. Larger quantities are to be preferred. Seeds should be accompanied by any information available as to origin, where purchased, age, &c.

If a purity report only is desired, it should be so stated, to secure a prompt reply. Germination tests take from six to twenty days, according to the seed.

There is no man in the country who needs to be a good business man more urgently than the farmer. He has a bewildering variety of problems confronting him, and many possible avenues of approach to them. He has to decide how much he can afford to try to produce to the acre; how far he can carry his investments in fertilisers; to what extent he can go into the raising of live stock, except as a by-product; how he can best arrange his activities so as to utilise his labour throughout the year steadily and economically; what size farm will give him the best result, considering his capital, his environment, and his capacity; how and under what conditions he can best market his products; and, in general, by what means he can improve his processes.—D. F. Houston, Secretary, United States Department of Agriculture.

The Buff-coloured Tomato Weevil.

(*Desiantha nociva.*)

WALTER W. FROGGATT, F.L.S., Government Entomologist.

THIS destructive beetle belongs to a small group of weevils which damage plants in both the larval and adult stages of their existence. The grubs are slender, active, pale green larvæ, quite unlike the typical form of the family *Curculionidæ*, and not unlike, in some cases, the caterpillars of sawflies.

These grubs hatch out in the soil, and sheltering underground come out at night and feed upon the bark and foliage of plants, they pupate in the earth, from whence, later on, the perfect beetles emerge, and do even more damage than the larvæ, also feeding at night and seeking shelter during the day time.

This species was recorded from Victoria in 1908-1909, by Mr. Chas. French, junior, in the *Victorian Journal of Agriculture*, from the vicinity of Melbourne, where it did a great deal of damage to tomato plants, cabbages, and other field crops. It is figured and briefly described in Part V of French's Handbook of the Destructive Insects of Victoria, 1911. It was scientifically described and named by Mr. A. M. Lea, in the Transactions of the Royal Society of South Australia, in May, 1909.

The buff-coloured tomato weevil is under half an inch in length, thick set in proportion to its length, with the short broadly rounded thorax, and back flattened. The snout is slender, with the usual elbowed antennæ, clubbed at the tips, standing out in front of the snout; at the extremity of the snout are situated the sharp jaws, with which it does all the damage. The ground colour, as is the case in many weevils, is dark blackish-brown, but so thickly clothed with fine buff and grey scales, and fine scattered hairs of the same tint, that it has a uniform earth-coloured tint that enables it to elude detection when resting motionless upon the dry soil with its legs tucked under its body, a fine example of protective mimicry. When disturbed, however, it is a very active little creature, and runs off to cover at once.

Feeding at night, and hidden away in the cracks in the ground, or just under the surface soil, these beetles may be quite numerous, and yet escape detection, unless looked for at night time when they are feeding.

This weevil has a wide range over the eastern and southern coasts of Australia, and in this State we have several records of it damaging the young buds and shoots of fruit-trees and vines in the early summer, but it was not known as a serious field crop pest until this season.

Early in October of this year several specimens were received at the office, chiefly from the Gosford district, with the information that it was doing a great deal of damage to the tomatoes. Last month, accompanied by the district fruit inspector (Mr. Oscar Brooks), I visited the tomato plots of Mr. Young, at Ourimbah, and saw the work it was doing.

A great number of the plants had been eaten out, and replaced for the second and third time by fresh seedlings; some of the older ones remaining were represented by a few inches of the main stem of what had once been a tomato plant, from which half the surface had been gnawed off in patches. Mr. Young had previously collected some hundreds of beetles, and we were able to discover about half a dozen, generally in pairs, hiding under the plants. When the owner had written asking for assistance, previous to my visit, knowing the habits of the beetles, I suggested scooping out little depressions in the soil beside the plants, and filling it up with a handful or two of weeds, grass, or loose rubbish. This experiment he had carried out, and had found it an excellent method of trapping the beetles that sought shelter under the rubbish, instead of burying themselves in the soil. Collected together in this way, it was a very easy matter to go round every morning, examine these simple traps, and destroy the beetles. He had previously been going round the tomato plots in the night time with a lantern, and hand-picking the beetles, but as they dropped off at the least alarm it was very unsatisfactory work. Where the seedlings are well grown, after being planted out, it might be possible to place a ring of stiff oiled paper round each stem, and keep the beetles from getting on to the plants. Though provided with a pair of well developed flying wings, hidden under the elytra or wing covers, I have never seen them attempt to fly.

About ten species of the genus *Desiantha* have been described from Australia, most of which have been recorded from this State. Probably most of them are very similar in their habits, while several are well known orchard pests.

One species, *Desiantha maculata,* has a very wide range over Australia, from New South Wales to the islands on the coast of Western Australia. Lea states that in Western Australia it is at times very abundant, and very destructive to the buds on fruit-trees, and especially bad upon the young shoots of the grape vines.

Another species, *D. malevolens,* is also a serious pest in the Swan River district of Western Australia, and does very similar damage in the orchards.

All these foliage-eating beetles are difficult pests to cope with, both on field crops and orchard trees, as they are much more difficult to kill with arsenical sprays than caterpillars, and would, even if the poison acting in a reasonable time, do most of the damage before they died. A contact poison has no effect upon them, as they are well protected with their hard chitinous covering. Therefore, trapping them seems to be the only practical way of destroying them.

Table Poultry.

JAMES HADLINGTON, Poultry Expert.

In approaching the subject of table poultry it is intended to do so from the point of view of the conditions existing in this State, and it may differ materially from popular notions regarding the subject. Accepted notions and practical commercial considerations are not always in accord, and the subject under discussion is an instance of this.

In so far as our own markets are concerned, and for that matter the markets of the world, it is a fallacy to suppose that large weighty table birds from which cuts from the breast can be made, after the manner of carving a turkey, are the kind that are either on the market or in unlimited demand; but such are the kind generally present in the imagination of most persons when thinking of table poultry. Nothing could be farther from reality when applied to the bulk of the poultry marketed. This is one notion that stands in the way of improvement, because it leads to an under-estimate of the potentialities of the cockerel portion of the output from our egg farms, and this is a phase of the subject which it is particularly desired to emphasise here, because the egg farm is, and must of necessity remain, the real source of supply, whereas the other is the ideal rather than the real.

True, in some countries there is a limited demand for such large meaty birds as referred to, and prices are paid for them commensurate with such size and quality; but even in these countries only a small percentage of the table poultry offering or in demand are of any such proportions. This can be verified by reference to the weights advised as suitable for export to England, when that venture was initiated some years ago. These also coincide with the demands of our own market, and which will be mentioned later. The fact is that such large meaty sorts cannot be produced at prices that will attract customers, because to produce them, meat would need to be made the main consideration and necessitate breeding the very large bodied breeds, and game crosses. The same applies to capons, which to make more weight than cockerels must be kept to a correspondingly greater age. This also will be subsequently dealt with. But no known success in specialising with table poultry has been achieved in this State, or perhaps in Australia, on a scale that could be considered a commercial proposition, not only because egg farming has proved more profitable, but from the fact that a smaller number of chickens need to be hatched to produce a given revenue. Much less expensive plant and less skill and experience are required to handle the smaller number. These are the principal factors putting specialisation with table poultry out of the question.

But it should not, and need not, be a bar to rearing a prime class of poultry suited to the demands of our market. Once our egg farmers become seized of the importance of this subject from their own standpoint poultry farming will be still more profitably carried on than it is at the present time.

Practical considerations such as these must to a large extent modify theoretical conceptions, and, as already stated, our egg farms are likely to continue to be the main source from which table poultry are drawn, but the way to improve these supplies and increase the profits of the farmer lies in the direction of better methods of growing, grading, and marketing of the cockerels, and farmers should look upon them as a profit-making asset, instead of as a by-product to be got out of the way.

Dual-purpose breeds such as Orpingtons, Rhode Island Reds, Wyandottes, Langshans, and similar breeds can be profitably run for egg production, and at the same time produce prime table poultry. Our laying competitions have shown that good strains of the breeds mentioned are little, if any, inferior in egg production to the popular White Leghorn, and have sometimes eclipsed them in the matter of value of eggs, owing to a slightly better egg production during the winter months. The drawback from the egg farmers' point of view is the broody propensity of the dual-purpose breeds, which involves a considerable amount of extra work, but against this has to be balanced the higher prices obtainable for the cockerels and also from the hens when their laying period is over.

The lighter Mediterranean breeds, such as Leghorns, are universally regarded as especially good layers, but the cockerels are looked upon as indifferent table fowls. It may, however, be stated that these may be made into very useful table fowls when a class of Leghorn that conforms to proper weight for the breed is being utilised, and when well-grown can be brought to 4 lb. or 5 lb. live weight, at from five to six months old. We must first get rid of the misconception that exists among beginners in the poultry business as to what constitutes good table poultry, and become familiar with the different grades of it.

A Simple Classification.

The following may be considered a fair classification for all practical purposes. It must be understood that the terms, prime, small, &c., apply merely as a comparison between birds of the same breed and not as a comparison between a specimen of one breed with a bird of another breed.

1. Stag—for boiling (Figs. 1 and 5).
2. Prime Cockerel—for roasting (Figs. 2, 6, and 7).
3. Cockerel, that requires fattening (Fig. 3).
4. Small roaster (Figs. 4, 8, and 10).
5. Griller (Figs. 11 and 12).

Figs. 1 and 5 represent what are known in poultry parlance as "stags, or as having become too "staggy." The significance of this is that they are too mature to be classed as roasters. Therefore, they have to be used as boilers in the same way as old hens, and their value in the market is about

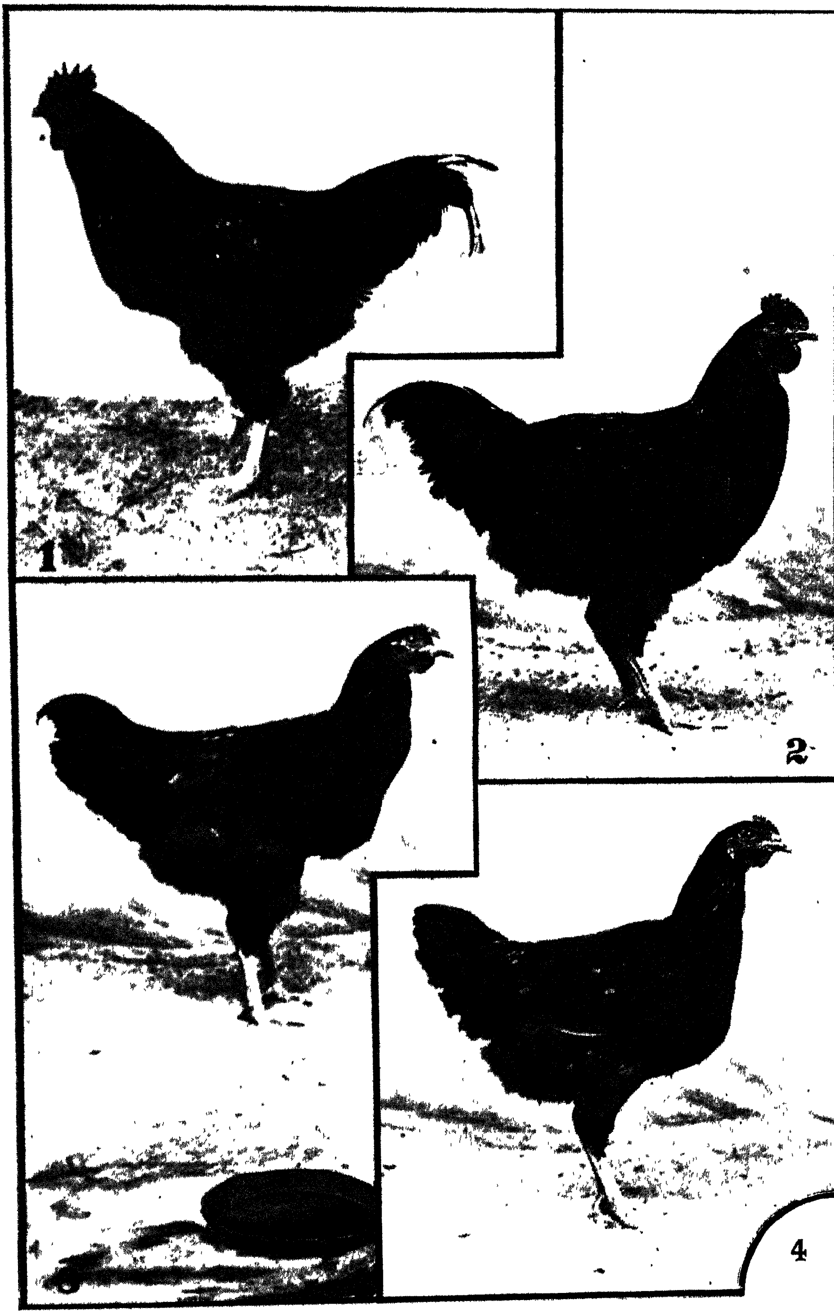

Fig. 1.—Rhode Island Red "Stag." Fig. 2.—Rhode Island Red Prime Roaster. Fig. 3.—Rhode Island Red (requires fattening). Fig. 4.—Rhode Island Red Small Roaster.

TABLE POULTRY.

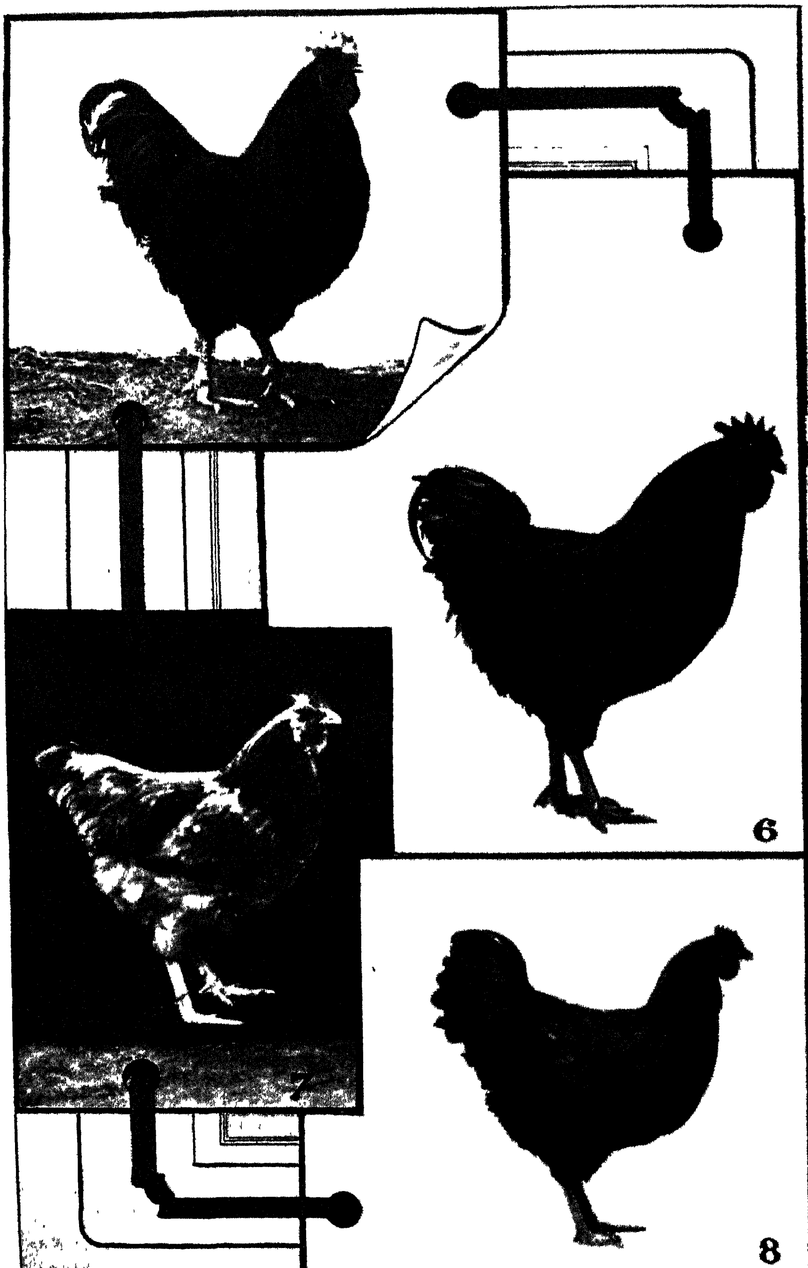

Fig. 5.—Black Orpington "Stag." Fig. 6.—Black Orpington Prime Roaster. Fig. 7.—Buff Orpington Prime Roaster Fig. 8.—Black Orpington Small Roaster.

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the same as the hens consistent with weight. This explains many cases where low prices are received for heavy weight birds while lighter weights have made much higher prices.

Figs. 2, 6, and 7 represent good roasters at say five to six months old, and about as many lb. live weight, which would represent a fairly fleshy condition, but which might be still further improved by fattening.

It will be noted that these birds are not "made up," *i.e.*, not fully feathered or mature in appearance, and have less comb and no spur as in the birds shown in figs. 1 and 5.

Fig. 3 represents a bird a trifle younger; he has the frame, but requires a little more flesh. Three weeks in a small pen or a fattening crate, will, under skilful treatment, make him into a very prime roaster.

Figs. 4, 8, and 10 represent a class of small roasters, four to four and a half months old. Birds such as these should be fairly plump. If they have been well grown, they may be marketed at this stage, or fattened up as already described. The point in this connection is that birds will often be plumper at four months old than two or three weeks later, chiefly owing to the fact that from this stage during the next three or four weeks, frame is being developed at the expense of tissue. A bird may thus be in primer condition for market, although of less weight than at three or four weeks later; of course, being of less weight he will command a correspondingly lower price than would those shown in Figs. 2, 6, and 7.

Grillers.

Figs. 11 and 12 represent a class by themselves, known as grillers, and are represented by chickens from 1½ to 2½ lb. live weight. These to be prime should be quickly grown and plump in the breast; this class often realises very high prices in the early spring months, up to the middle of November. From that time on it is usual for poultry farmers to overdo the markets with this class, consequently they have often to be sacrificed at very low rates; limited demand and over supply are the two factors operating. When this stage is reached poultry farmers would do well to hold much of this type back, with a view to keeping them longer, and making them into the classes already specified, for which there is always a greater demand and payable prices.

It is folly on the part of poultry keepers if they can avoid it, to persist in sending large consignments of these birds when they can only become a drug on the market. But if in some cases circumstances will not permit of keeping them to the proper age and weight, that is the misfortune of the poultry keeper rather than the unprofitable nature of the recommendation made to keep them longer.

Fattening.

Fattening, as generally understood, is but little attempted by poultry keepers in this country, principally for the reason already referred to. But more could be done with advantage. In this connection if we exclude "cramming," which is not likely for several reasons to become

general, fattening is a very simple operation, and easily understood rules of feeding and conditions are all that is required to ensure success. The first requisite in fattening is strong, well-grown chickens; no amount of work or the best conditions can make weedy ill-conditioned specimens into prime table fowls; it is therefore, a waste of effort to attempt to fatten such. The next essential is restricted run; the birds should be confined to crates or small yards. Three weeks is the time necessary for the purpose; if they are not fattened in that time, the attempt may be regarded as unsuccessful; this is important. A handy crate for fattening is a slatted one, constructed with 3 inch x 1 inch Oregon battens, with no bottom, which should be placed in a shed or covered up in some way from sun and rain. A good size is 8 feet x 2 feet x 2 feet, with slats 3 inches apart, divided into three compartments by two partitions. An opening should be left in the top to get the birds in and out; a movable stave can be arranged to suit this purpose. The birds get their feed and water through the slats at the side, these being placed on the outside of the coop. Such coops will accommodate from eighteen to twenty-one birds. A number of these can be placed side by side in a shed.

Feeding.

Unfortunately there is not as wide a range of foods suitable for this purpose available in this country as in some others. At the same time it should be remembered that many fattening formulas that are widely advocated are little used by experienced poultrymen, simpler ones being found to give equally good results, and in many instances even better. One thing must be kept in view, *i.e.*, whatever the formula may be it is of no use unless the birds eat it with avidity; and herein is the cause of many failures to fatten. It often happens that a fattening formula is adopted, and the birds are unaccustomed to one or more of the ingredients, and they refuse to eat sufficient of it. Poultry will usually eat the largest amount of the food that they are used to, and to induce them to consume as great an amount as possible is the main consideration, of course, consistent with it being highly nutritious.

Soft food of the description of a morning mash should form the bulk of the food given during the fattening period. Very little grain of any kind should be allowed, and then only to induce them to eat more food. But this inducement to eat the largest amount of food should be largely restricted to the last two weeks in the crates. If forced feeding is attempted at the outset the probability is that they will get surfeited before the full time, and the whole effort to fatten will fail. Rather should they be kept a little on the hungry side for the first week. Preparatory to putting them in the fattening crates it will be best to underfeed them somewhat for a day or two, but on no account to let them go without a meal; this is not the way to induce appetite, as many suppose. Slight shortage at each meal is the best way to induce a keenness for food. A teaspoonful of Epsom salts to each bird before crating

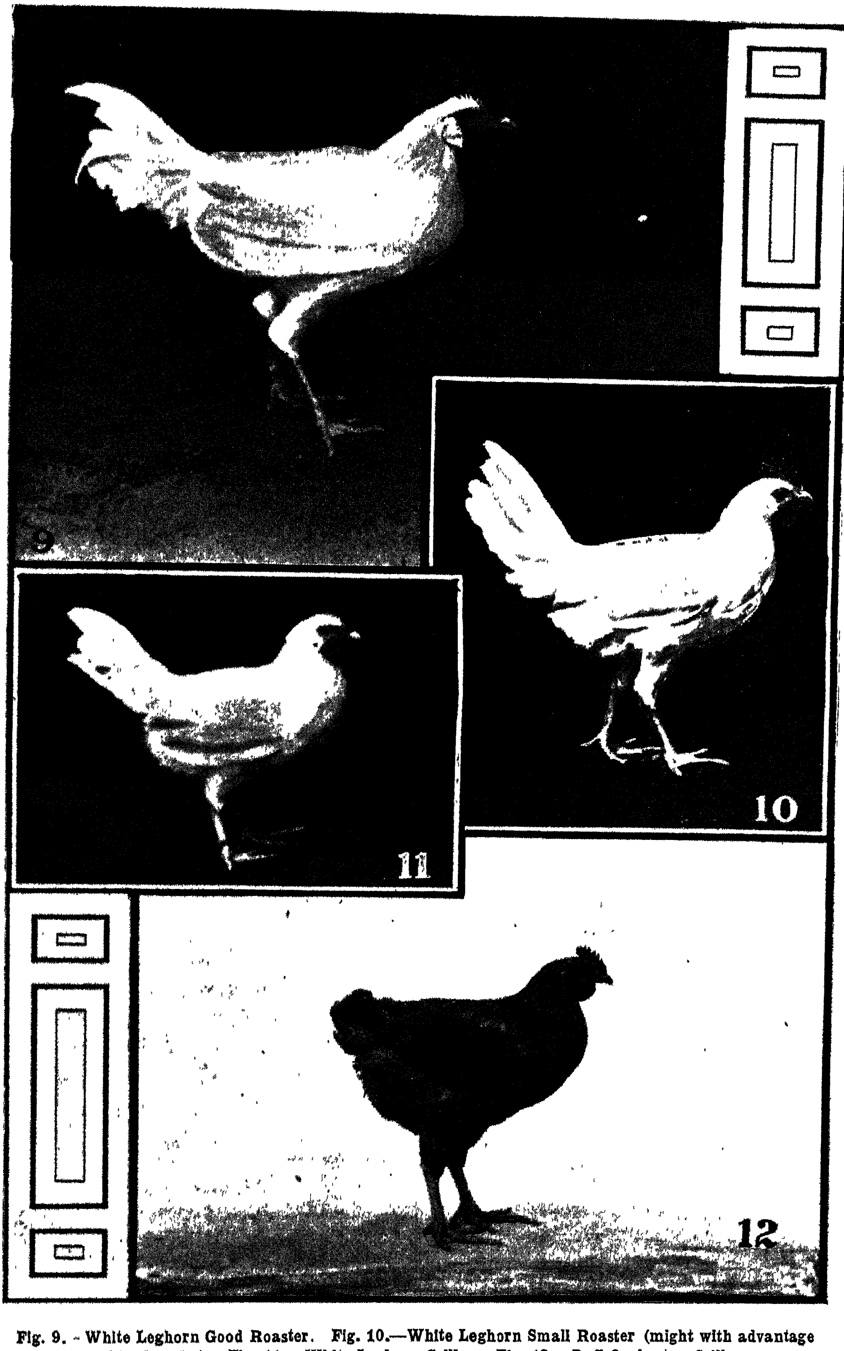

Fig. 9.—White Leghorn Good Roaster. Fig. 10.—White Leghorn Small Roaster (might with advantage be ½ lb. heavier). Fig. 11.—White Leghorn Griller. Fig. 12.—Buff Orpington Griller

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is also advisable. The tendency is for the birds to sulk and go off their food when put in the crates, especially if at all full fed previously, therefore it is important that everything possible be done to overcome this.

The mash may consist of the following ingredients and proportions, and may be mixed with milk or offal soup :—

Pollard	30 lb.
Bran	20 „
Oaten pollard	20 „
Maize meal	20 „
Pea meal	10 „
	100 lb.
Common salt	22 ounces.

The birds should be fed three times per day and given as much as they will eat. Only a small amount of grain (if any) should be fed, and very little green feed should be allowed during fattening.

Capons.

These notes would be incomplete without some reference to "capons," and here again the remarks are confined to the conditions of our own market. The first question that occurs is, "Have we a remunerative market for capons?" and this is answered in the opening paragraphs. If there is no market or only a limited one for large table birds then the same applies to capons, because there is certainly no advantage in small capons.

The next question is, "Is there any advantage in caponising as regards weight for age?" The popular idea is that such is the case, but practical experience proves that there is little or no advantage in caponising unless the birds are to be kept to over, say, five or in some cases six months old. And here again the same problem presents itself. Is there any advantage in heavy-weight birds, seeing that this weight can only be attained at the expense of keeping them to greater age? But the advantage that would accrue, providing we could get corresponding price per lb., is that capons remain tender and the flesh is of very fine quality at many months old, whereas the cockerel gets "staggy" and deteriorates in quality after six months. Then, as regards prices for capons of given weight, we find that in countries where there is a more or less extensive market for capons that they will not command more per lb. at seven months old than cockerels of the same weight.

The advantage then of caponising resolves itself into keeping birds to a greater age and weight, and still retaining their tenderness and fine flesh.

It has been stated that it will pay to caponise cockerels of Leghorn or similar breeds, because they can be kept to an age sufficient to make good table birds without becoming such a trouble as they usually are if kept over five months; perhaps this is tenable. But as regards the heavier breeds, and, except for special orders, few will be found to repeat their first experience under the present conditions of our market.

The Ideal Table Fowl.

To produce ideal table birds, regardless of financial considerations, recourse must be had to the very heavy bodied breeds, such as Dorking, Sussex (any colour), Plymouth Rocks, and Langshans (modern), which have also been bred for size rather than other qualities. These may be either pure or crossed with Game. Dual-purpose breeds, such as Orpingtons (particularly the Buff and Speckled), the Wyandottes, and the Rhode Island Reds, crossed with Game (Indian, Malay, or Australian for preference), may also be used. These represent the larger kinds available; but it should be understood that first crosses are the most satisfactory, and that re-crossing means deterioration as compared with first crosses. Cockerels of the breeds mentioned should, if well grown, weigh 7 to 8 lb. at six months old. These can be fattened as already suggested. Eggs must, however, be a secondary consideration when these weights are aimed at.

Marketing.

There is much room for improvement in methods of marketing the birds There are a large number of coops available at the sale rooms in which to grade and display the birds on sale days, but these are usually taken up by suburban breeders who bring in their own birds early, while very many consignments arriving ex rail and boat are sold on the floor of the sale rooms in the coops in which they arrive. Many of these coops are packed too full, with all ages and conditions, with the result that it is most difficult for the prospective buyer to determine their value, and much less so the auctioneer, as a consequence, the value is most likely to be assessed on the worst specimens in the coop. Under such conditions it is not surprising that consignments often fail to realise expectations. More attention paid to grading, packing, and marketing should result in more satisfactory prices and a larger demand.

Facilities for Marketing.

For the information of country consignors it may be stated that poultry and turkey coops are provided by the Railway Commissioners for the purpose of sending these products to market. Notice of requirement of such coops should be given to the local station-master three days in advance.

Following are the rates and conditions:—

POULTRY CONVEYED IN CHIEF COMMISSIONER'S COOPS.

For each small Coop, capable of holding about 12 pairs of Fowls or Ducks.

	Rate. s.	d.		Rate. s.	d.
Up to 50 miles	2	6	176 to 200 miles	6	6
51 to 75 "	3	0	201 to 250 "	7	0
76 to 100 "	4	6	251 to 300 "	7	6
101 to 125 "	5	0	301 to 350 "	8	0
126 to 150 "	5	6	331 to 400 "	8	6
151 to 175 "	6	0			

And 6d. per coop for every additional 50 miles or part thereof.

POULTRY CONVEYED IN COOPS—*continued.*

For each large Coop, capable of holding about 8 pairs of Turkeys or Geese.

	Rate. s. d.		Rate. s. d.
Up to 50 miles	3 2	176 to 200 miles	8 4
51 to 75 "	4 5	201 to 250 "	9 0
76 to 100 "	5 8	251 to 300 "	9 8
101 to 125 "	6 4	301 to 350 "	10 4
126 to 150 "	7 0	351 to 400 "	11 0
151 to 175 "	7 8		

And 8d. per coop for every additional 50 miles or part thereof.

Coops not to leave railway premises; but, if permitted, a deposit of 20s. must be lodged with the station-master, and if their return is delayed, a demurrage charge of 2s. 6d. per coop per day will be made for each day or part of a day delayed over three days, exclusive of Sundays and public holidays.

The maximum charges for the detention of poultry coops will be :—

	£	s.	d.	
Large coops	1	6	6	each.
Small "	1	4	6	"

Coops must not be sent into other States.

The practice with many poultry farmers is to bring the birds to the railway station in their own coops, and transfer them to the Commissioner's crates, in which case no deposit is required. The crates are then consigned to selling agents who pay freight and charges at their end, and deduct same from account sales.

Consignors would do well to arrange as far as practicable with selling agents to remove their birds from these crates into the sale pens, where they can be graded and displayed to best advantage.

Another matter of importance is that the number of birds to the crate, as stated in the regulations, is or should be, the maximum, and consignors will do well to put fewer birds in them, where adult or large birds are sent. Nine or ten pairs of such is enough.

ROYAL EASTER SHOW TO BE HELD AS USUAL.

THE Secretary of the Royal Agricultural Society states that rumours have been current that in consequence of the military authorities occupying the show ground there was a danger that the Royal Show would not be held next year. The Secretary has, however, received an assurance in writing from the Minister for Defence that the show ground will be available for the show. The dates of the show are APRIL 18TH to APRIL 26TH, 1916, and the prospects at present are very encouraging. Several importations of stud stock are being made and timed so that the animals will come into competition at Easter. The society is giving a very much increased prize list for this show, and the management expects that the exhibition will be as great as any that has preceded it.

Poultry Notes.

JAMES HADLINGTON, Poultry Expert.

December.

By this month the maximum egg production will have been passed, and poultry keepers must expect their yields to decrease from now until June. In consequence, prices for eggs will be on the up grade, which is simply a case of cause and effect. Many hens will go off laying and others will only lay in an erratic manner, and will very soon fall into moult. This is a matter that should receive the close attention of poultry farmers with a view to disposing of the unprofitable hens, and all those that it is not intended to carry through the moult into next spring should be carefully scrutinised and marketed as they go off laying. It should not be a difficult matter to pick out the hens that have stopped laying, but I find that there is a disposition among beginners, and also many whose experience should have taught them differently, to expect these hens to come on to lay again at an earlier period than they are likely to do. Last year this idea was responsible for a great deal of loss resulting from keeping these old hens. The fact of feed being dear of course accentuated the trouble, but it is an experience occurring every year and it is not realised until a good deal of loss has been sustained. These old hens are kept on month after month with the hope that they will come on to lay again soon. Some, of course, do so, but the greater part of those that stop laying after the end of December will probably be found to lay very few eggs until after the moult, and remain unprofitable until the end of June or even later. Good second year hens should, of course, become profitable from that time on to the following January or February.

It may be well here to define what is understood by first, second, and third year hens. A pullet is considered to be such up to twelve months old, but she may be considered in her first year of laying until after her first moult, say, to the end of March. This, of course, refers to seasonably hatched stock. She may then be considered to start on her second year laying, and be classed as such until, say, the end of March again. But should she cease laying after the end of December it is advisable to dispose of her (unless reasons other than her mere laying qualities warrant her retention), as this stage is considered to terminate the profitable life of most layers.

It may, however, be mentioned that there is usually a small percentage of hens in their first year's laying no more worthy of being kept than many in their second. These conclusions will be better understood from what is brought out by laying competition figures. Taking the year 1913–14, which is fairly representative of the series, it will be found that performances of

the thirty leading pens which were selected to carry on in the second year's test, and which were in the first place presumably selected hens and considerably above the average of any farm, work out an average of 8·8 eggs per hen per month from January to June inclusive. When these are taken as the performances of such selected hens in their second year laying, what, it may be asked, can be expected from those in their third year over the same period?

The figures for each individual month, for these selected hens in their second year of laying are: January 15·2, February 12·8, March 10·7, April 4·4, May 3·8, June 6·0 per hen. It would be fairly safe to base expectations on 30 to 50 per cent. less for hens in their third year laying, and probably two-thirds of the hens referred to would be laying nearly all the eggs. Therefore December and January are indicated as the months in which the weeding out of the hens which are in their second year of laying should commence, unless it has been decided to carry them over another year as breeders for some special purpose.

The point to be observed is that it is a losing proposition to carry these non-productive hens through the slack laying season and through the moult, and then dispose of them in the winter after the mistake has become apparent

Maize Feeding.

If the recent scarcity of poultry foods has resulted in breaking down some of the prejudice against maize as a feed for poultry it will not have been without its beneficial effect upon the poultry industry and the country generally. That there has been an undue amount of prejudice against maize feeding will be admitted by a large number of poultry keepers. During the recent scarcity hundreds of poultry keepers have fed their hens on maize almost exclusively for the evening feed, and without any apparent ill-effect, and many admit having secured better results than when feeding on wheat only.

A typical case of the doubts still felt on this question is that of a correspondent, who has been feeding on maize during the last seven or eight months, and who, having 365 laying hens, was securing 300 eggs per day up to the end of October (the time of writing). About this time he happened to kill a few hens, and found that although full of eggs there was a considerable amount of internal fat. This being the case he was fearful lest some calamity should come to his poultry later on as a result of this, and therefore asked whether it would not be best to cut down his feed considerably, so as to reduce what he considered the over-fat condition of the hens. My reply to this was that his egg production was considered to be highly satisfactory, but if an attempt was made to reduce the fat condition of his hens by cutting down the feed allowance, he would most certainly reduce his egg output, and probably throw the birds into an early moult. It was pointed out that the idea of hens being too fat to lay was one of the many fallacies accepted by poultry keepers, which mostly arose from the fact that hens which run to flesh are mostly the poor producers. But some distinction

had to be made between fleshy hens and internally fat hens. The fact that his hens were able to sustain such heavy laying and still remain fat internally, went to show that they had a surplus which was probably a factor in sustaining them in such laying. Doubtless his maize feeding was responsible for some extra internal fat; but it was also probably responsible to some extent for his extraordinary egg yield.

I did not anticipate that anything very serious was likely to happen to the hens in question, but wheat might with advantage gradually replace portion of the maize, and I recommended two-thirds wheat to one-third maize for evening feed. Also, that advantage might be taken of the approaching moulting season to reduce the feed of any hens that appeared unduly heavy. This could be done as they went off laying by having a separate run to put them in under a special dietary. A less concentrated ration might be fed to these.

One thing might be noted, which was, that the hens were then at their maximum laying point, and no matter what the owner did or did not do, the egg supply would be a falling quantity from that time on until May. It is necessary to mention this to avoid arriving at the conclusion that the reduced egg yield was the result of the fat condition of the birds.

Housing the Pullets.

The pullets of last season's hatching will soon be approaching the laying stage, and the problem of housing and yarding them will present itself to the poultry farmer who has an increasing stock. In this respect more up-to-date accommodation is coming into vogue. Many poultry farmers are adopting the semi-intensive system of running their layers, and it is one that can be recommended where the expense can be incurred. This system, of course, involves building houses rather more than double the size that would be necessary for roosting room only; but if this system is to return results commensurate with the outlay, it must be carried out in its entirety, and not, as is often seen, with the essential part of the system wanting. Many poultry keepers have gone to the expense of erecting semi-intensive houses, but have failed to put in scratching material, which is the essence of the system. Under such conditions no benefit can accrue from such outlay. It may be explained that this system should not be confused with the intensive system. The latter is that of keeping the fowls confined to the houses with similar scratching material to that of the semi-intensive, but the latter pre-supposes that the fowls have a run out as in the ordinary method. The difference merely consists in the size of the house and provision for scratching, which might consist of straw litter, stable manure, or bush scrapings. The last is much inferior to the others.

Another system consists of enclosures equal to free-range with roosting room only, and pre-supposes that grass is growing in the runs. To do this on ordinary grass land an acre will be required to each 250 to 300 layers, according to the quality of land.

How to set out a Right Angle in the Field.

P. G. GILDER.

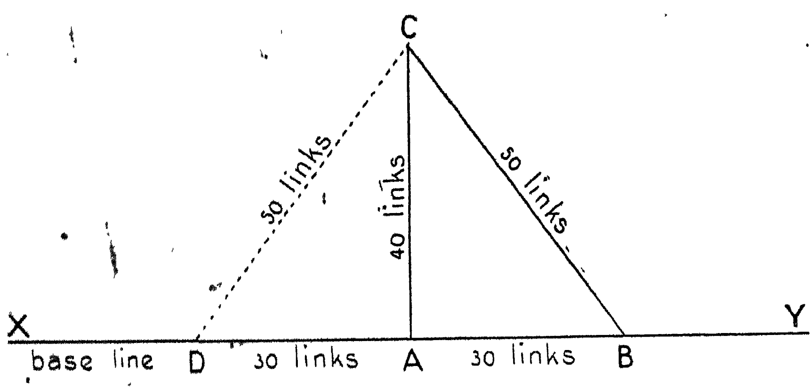
A CORRESPONDENT recently asked for details of a convenient method of laying out a right angle in the field without the use of an expensive instrument. There are several which may be adopted, but the following may be considered as simple as any :—

The 3, 4, 5 Method.

This is based upon the well-known principle that any triangle having its sides in the proportion of 3, 4, and 5 contains a right angle. The method may be used by anyone who possesses a "box" tape 1 chain in length, marked in feet on the one side and links on the other. To reduce the margin of error, it is best to have the sides as long as possible, and if we use 30, 40, and 50 links the triangle is of fair proportions and as large as the length of the tape will allow.

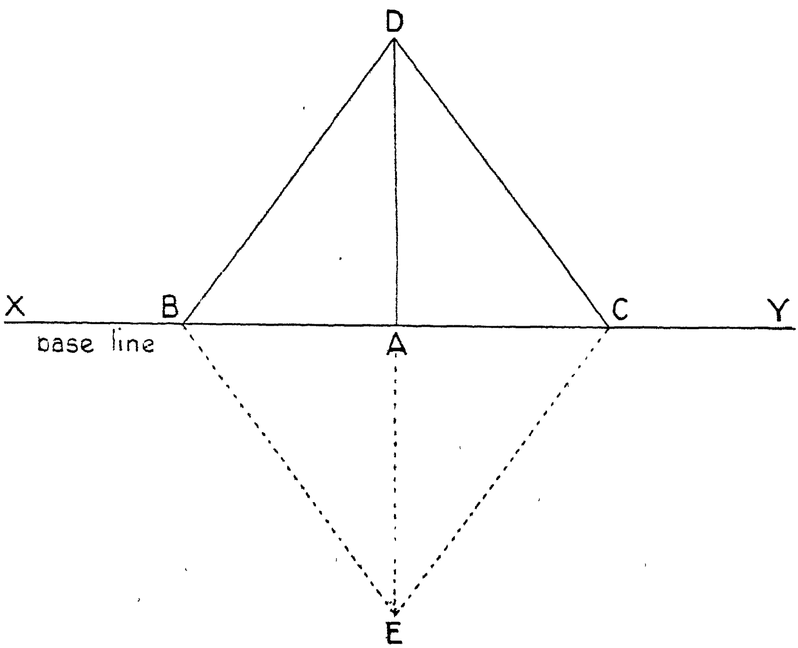
From the point at which it is desired to set out the right angle (marked A on the diagram) measure off along the base line 30 links to B, and there insert a small peg. Then by holding the ring of the tape at A and the mark on the tape at 90 links at B, going out in the direction desired and drawing both parts of the tape taut at 40 links, the line at right angles, AC, will be found. By repeating the operation on the other side of the line (AD) the accuracy of the line AC can be proved. If the different positions of the point C are only, say, an inch apart, halve the error; if more than this, repeat the operation with greater care.

Two men are usually necessary, though if the 90-link mark on the tape is carefully placed in a cleft peg at B, one man can find the point C.



A Second Method.

Where no tape is available, a method may be adopted which requires only the use of a piece of inextensible cord of unknown length. Let XY be the base line and A the point at which it is desired to set out the right angle. Make a small loop (just large enough to go round a peg) at each end of the cord, and then carefully knot the cord in the exact centre. Mark off with pegs points B and C at equal distances from A, using the cord for the purpose and making each distance about one-third or one-quarter of the total length of cord. Place the loops of the cord on pegs at B and C, and stretching it in the direction desired, the point D will be found by means of the knot, making AD at right angles to XY. By repeating the operation at the other side of the line, point E will be found, and the pegs at E, A, and D should be in one straight line. Only one man is required.



The accuracy of this method depends very largely on the class of cord used, as if it is stretched unequally the lengths of what should be equal sides will vary.

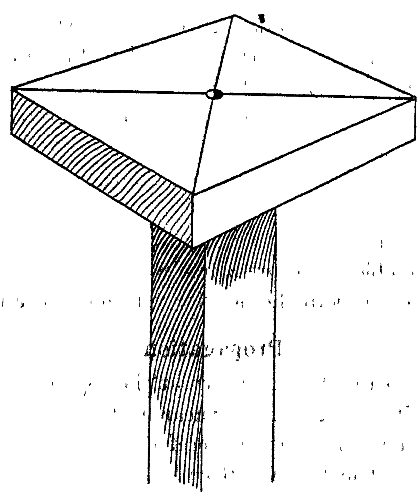
The Cross-staff.

A convenient little instrument for setting-out right angles is the cross-staff, which may be made by any handy farmer in an hour or two on a wet day. A large number of these have been made in the carpenter's shop by farmers attending the Winter Schools at the Hawkesbury Agricultural College.

It consists of a piece of well-seasoned wood, about 5 or 6 inches square, and 1 inch thick. After accurately planing one end, the other three must

be set at absolute right angles, to form the square. On its upper surface are then sawn two diagonal saw kerfs or cuts, which thus meet at right angles at the centre. These saw kerfs should be strictly vertical, and should be cut about ¼-inch deep, with a good tenon saw. Where these diagonals meet a hole should be bored to take a screw, and the top of the hole should be countersunk, so that the top of the screw comes below the saw kerfs, and does not interfere with the line of sight. The cross-staff can then be screwed to the flat top of a pointed hardwood stake, say, 2 inches square, or to a round stick, such as a broken hoe handle, the screw being kept just tight enough to keep the cross-staff in position, and yet to be turned slightly without much difficulty.

Two men are required, one to remain at the cross-staff, the other to place the sighting poles where directed.



By sighting the cross-staff along the base line, and then setting out a sighting pole in line with the other diagonal, a right angle is easily obtained. Its accuracy can easily be proved by turning the cross-staff round one quarter, or 90 degrees, and repeating the operation.

One great advantage of the cross-staff is that the saw cut  excludes the view of trees, buildings, and other obstructions, and concentrates the attention on the pole ahead. A sighting pole, especially when painted white or when a sheet of white paper or cloth is tied round it, is easily discernible 10 chains away.

The same instrument may also be profitably used in laying out an orchard or a vineyard on the rectangular system, especially in small areas, or on sloping country, where the use of a planting wire is undesirable. By sighting along one diagonal in line with the base and then along the other, and ensuring that all the pegs are in line, the orchard may be planted out in the symmetrical manner which conduces to easy cultivation.

The Pineapple.

W. J. ALLEN.

THE growing of pineapples has not received the attention which it deserves from fruit growers and farmers. Although the demand is much greater than the supply in our markets, still very few locally grown fruits reach Sydney, and we have to depend upon Queensland and the Islands for our supplies. On the coastal highlands, from the Manning River northwards, the pineapple thrives exceedingly well.

On the route from the Bellinger to the Tweed there are several small plantations to be found, but most of the fruit grown is sold in the neighbouring townships. A well-known grower, who has a few acres quite close to the Bellingen township, reports that as much as £75 per acre can be secured from this fruit when properly cared for.

The principal point to bear in mind in pineapple growing is that the fruit is a tropical one, and therefore it will not stand low temperatures; so, in selecting a site, care should be taken to plant where danger from frost is not imminent.

Although the pineapple does not require the very best soils, it is always advisable, where possible, to secure a free working soil that is well drained. The pineapple thrives on both the heavier volcanic soils and the sandy loams.

Propagation.

The plants are increased by the crown at the top of the fruit and the slips which cluster about its base, the suckers near the foot of the stalk, or the ratoons from the root. Suckers are generally preferred, as being much the strongest and soonest to arrive at maturity. Ripe fruit may be expected from these in twelve months, and from slips and crowns in two years. Each stalk bears but once and is renewed by the suckers, too many of which should not be left, otherwise the fruit will be small and inferior. The natural increase of the pineapple is exceedingly rapid.

Preparation of the Ground.

The ground should be thoroughly broken up, say, to a depth of 8 inches the season before the plants are set. Where possible, a crop should be planted which requires clean and thorough cultivation, so that the ground may be frequently worked and sweetened to bring it into a nice friable condition.

The offsets for planting are prepared by stripping away a few of the leaf-butts and paring the ends smoothly, which helps the formation of tap-roots. This brings the young plant in close contact with the soil, and encourages the roots to strike right away. Although this method is generally practised, some growers prefer to plant with the lower leaves spread out and covered with soil, which is firmly tramped around the stalk, care being taken that the soil does not become lodged in the centre of the crown of the sucker.

Smooth-leaf Cayenne Variety at Grafton Experiment Farm.

THE PINEAPPLE.

Pineapple Plantation at Grafton Experiment Farm

THE PINEAPPLE.

The sets should be planted as follows :—Slips about 3 inches deep; suckers 4 to 6 inches. When planting out, the rows should be from 6 to 8 feet apart, and the plants from 1 to 2 feet apart in the rows. When planted farther apart they do not support and shade each other, and the fruit is liable to fall over and break off; also to become sunburnt.

The number of plants to the acre at various distances is as follows :—

System of Planting.	Varieties.	Distance apart of Plants in rows.	Width of paths between banks.		
			6 feet.	7 feet.	8 feet.
Single row	Small ...	12 inches	7,263	6,223	5,445
	Large ...	15 ,, ...	5,810	4,978	4,356
Double row	Small ...	12 ,, x 12 inches..	12,688	11,075	9,826
	Large ...	15 ,, x 15 ,, ...	9,841	8,623	7,674
Triple row	Small ...	15 ,, x 15 ,, ...	12,805	11,408	10,285
	Large .	18 ,, x 18 ,, ...	10,132	9,076	8,280

The offsets are generally planted in the summer and fall months, when the moisture needed for root development is supplied by showers. It is of importance that they should strike quickly and grow at once; if they become stunted the fruit is naturally diminished and retarded.

Planting.

In planting, it is a good plan for the plants to be dropped the required distance apart, and then planted by the use of a blunt dibble with which to make holes 1½ inches to 3 inches, according to the size of the plants. The base of the plant is inserted into the hole, and the soil pressed firmly down with the dibble and with the foot.

In the single row method the plants are set from 12 inches to 18 inches apart in rows, the rows being 6 feet apart.

The beds may be made by ploughing two furrows together. This system admits of easy cultivation, and on the other hand, there are large vacant spaces which it is necessary to cultivate to keep clear. The main objection to the one-row system is that as soon as the fruit attains any considerable size it does not remain in an upright position. This results in sun-scalding, and the plants are apt to blow over.

For double rows, the beds are laid off by ploughing several furrows together, using hand-work in finishing off. The plants are set from 12 inches to 18 inches apart each way. This system has all the advantages of the one-row system, and the disadvantages of plants and fruit falling over is greatly reduced, although it leaves much to be desired in that respect. In soils that are inclined to be weedy, the two-row system is preferred to any other.

In the three-row system more hand-work is needed. This system practically eliminates the falling over of the plants.

Cultivation.

Cultivation should be strictly attended to, so as to keep the plants strong and healthy; weeds should be kept down. The period of profitableness of a plantation varies from five to eight years, but with thorough cultivation and fertilising it may last longer.

Pests.

As a rule, there are very few pests to worry the pineapple grower: but when a pine is found to be sunburnt and going bad from this cause, remove the fruit at once and burn or boil it. Fruit damaged in this way soon becomes rotten on the plant, and then becomes a harbour for beetles and other pests, which in time may attack the healthy fruits.

Gathering.

The fruit should be fully matured and beginning to change colour before gathering. For near-by markets the fruit may be allowed to become riper and more fully coloured, but should not be allowed to become over-ripe. Naturally over-ripe fruit bruises easily, and will not carry well.

When the fruit is marketed long distances, it is picked before it is quite ripe, a portion of the stalk being left attached, or else the fruit will bleed. The crown is also left intact, and should not be trimmed, which would rob the fruit of its decorative appearance.

The fruit may be cut from the plant. The greatest care must be exercised, so as not to injure the fruit or plants. When gathering the fruit, be careful to cut the stem well below the gill sprouts. Breaking off the fruit is liable to injure the base of the fruit, which causes an early decay and damages the fruit for shipping.

The case used for packing is the Tropical Fruit Case, which is of the following dimensions (inside measurements):—24¾ inches long by 12 inches wide by 12 inches deep, the capacity being not less than 3,564 cubic inches.

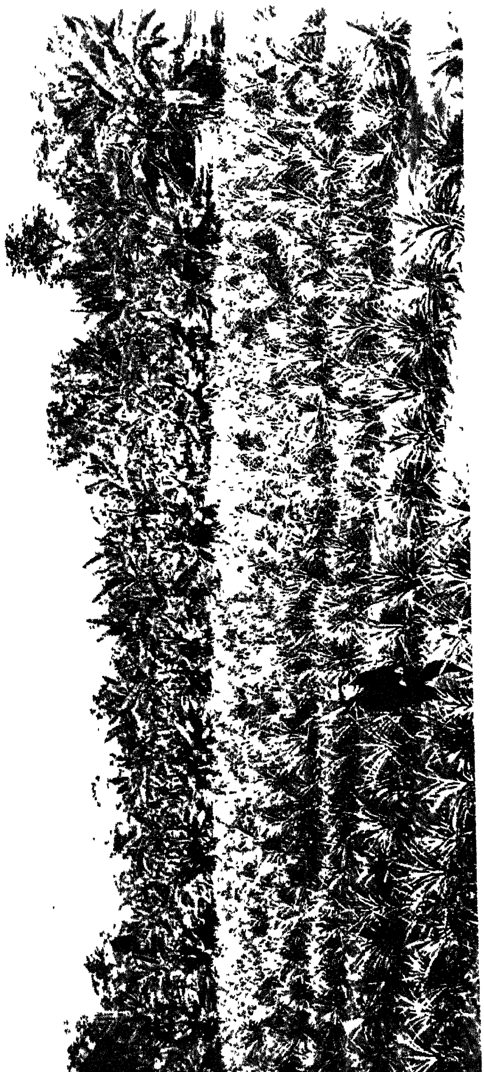
When packing, the fruit is known by the number it requires to fill a case, viz., 18's, 24's, 30's, 36's, 42's, 48's, and 54's.

Curing.

The weather conditions at harvesting determine the amount of curing required. The fruit should be placed in an open, dry, shady place for at least one or two days. It is sometimes necessary to pick during wet weather; then the fruit must be dried and cooled. For this curing, set the pineapples on their crowns, base up. Damp and uncured fruit will often carry to market, but it is not safe to risk when building up a sound business.

Varieties.

There are a good many varieties of pineapples; but, for commercial purposes, the most widely grown—as being the most delicious, hardy, and best shippers—are Red Spanish, Smooth Cayenne, Porto Rico, and the Queen. Other good varieties are Black Jamaica, Ripley Queen, and Abbaka. In the north coast districts, from the Tweed Heads to Coff's Harbour, the Smooth-leaf Cayenne is proving at present the most satisfactory one to grow.



Pineapple Plantation at Grafton Experiment Farm. Bananas in background.

The Pineapple.

Queen.—This is the queen, *par excellence*, and the parent of the whole family of Queens. The plant is free-growing, compact and handsome, coming quickly to maturity. The fruit is of an attractive yellow colour, very juicy, of exquisite flavour, and a good keeper. Weight, 3 to 8 lb.

Red Spanish.—Usual weight, 2 to 6 lb.; sub-acid, juicy, hardy, and early.

Smooth Cayenne.—Leaves long and smooth or with very few spines, broad, dark green; flowers purple; fruit very large, pyramidal, dark orange yellow; flesh pale yellow, rich, highly flavoured; pips large, flat. Does not sucker so freely as other varieties. Usually weighs 6 to 10 lb. Largely grown for market.

Porto Rico.—A very robust plant, and producing very large fruit; a good shipper; of fair quality and flavour.

Ripley Queen.—Leaves green, with purplish longitudinal streaks running through the centre; the spines are numerous.

Back Numbers of the "Gazette" Required.

We have received a request from the Lawes Agricultural Trust, of the well-known Rothamsted Experimental Station, Harpenden, England, for copies of No. 12 of volume VII, and of No. 3 of volume X. Should any of our readers have either of these to spare, and forward them to the Editor of the *Gazette*, they will be conferring a favour on the Trust.

Agricultural Bureau of New South Wales.

NOTES COMPILED BY H. ROSS, Chief Inspector.

SINCE the commencement of this movement in 1911 highly satisfactory progress has been made, as will be observed on reference to the long list of country branches, and on perusal of the notes of meetings of the various branches published herein from time to time.

The main objects of this organisation are to impart agricultural education to farmers by means of lectures and demonstrations by departmental officers, and to encourage farmers to assist one another by gathering together regularly and exchanging their ideas and experiences, principally as regards local conditions, and, of course, regarding agriculture generally.

Farmers are invited to join the local branch, and can do so by getting into touch with its honorary secretary.

In districts where no branch exists, farmers are asked to co-operate with the Department in endeavouring to establish a branch. Full particulars regarding the usual method of procedure, &c., will be furnished on application to the Under Secretary and Director, Department of Agriculture, Sydney.

Notice to Honorary Secretaries.

It is important that regular monthly meetings should be held, and that a record of the meetings of the branches should be inserted in the *Agricultural Gazette*. Honorary secretaries are invited to forward to the Department a short account of the proceedings of each meeting, with a brief summary of any paper which may have been read, and the discussion that followed it, as early as possible after each meeting. Notes for insertion in the *Agricultural Gazette* must reach the Department before the 14th to ensure insertion in the following month's issue.

Insect Pests.—Quite a number of the branches have availed themselves of the Department's offer to supply a set of the common insect pests of the district, and collections are cased as required. The Government Entomologist suggests that as each district has certain pests peculiar to its orchards and gardens, more useful work would be done if the members themselves collected the local pests (orchard, garden, and stock) and sent them to the Department, where they would be arranged, mounted, a descriptive label attached, and returned to the branch. Mr. Froggatt considers that such a collection would have a far greater value, as there would be more interest attached to the specimens when the members knew exactly where the pests came from, and where and how to find them.

Sheaves of Grasses.—The Department is prepared to supply to branches of the Bureau which make application through their secretaries, collections of sheaves of grasses considered suitable for the respective local conditions.

Formation of Libraries.—It is suggested that each branch should arrange to establish a library for the use of members; it is thought that this would be a capital way of expending surplus funds.

Secretaries of any branches which may decide to form a complete library are invited to communicate with the Department in the matter, and they will be furnished with an appropriate list of standard works.

Each branch when formed is supplied with a set of available *Farmers' Bulletins,* and from time to time new bulletins are sent to the secretaries for addition to the files. In addition to this, individual members can also procure copies of any bulletin or publication that may be of interest to them in their particular branch of rural industry, by applying for the same through the secretary of the local branch.

Organisation of Branches.

An officer (Mr. A. M. Makinson) has been appointed especially to attend to the needs of branches of the Agricultural Bureau, and generally to organise this movement.

He will visit in turn every branch throughout the State, and confer with the secretaries and members as to future operations, &c.

Demonstrations in Clearing Land and Subsoiling with Explosives.

A limited number of demonstrations in clearing land and subsoiling with explosives will be given by Mr. C. W. Burrows, Assistant Inspector of Agriculture, to branches of the Agricultural Bureau. Branches who wish to take advantage of this offer are requested to make early application to the Department through their honorary secretaries.

Bee-keeping.

A series of lectures on bee-keeping is being arranged by Mr. R. G. Warry, Instructor in Apiculture. Secretaries, whose branches intend availing themselves of this opportunity to receive a practical insight into this branch of agriculture, are requested to make early application.

REPORTS AND NOTICES FROM BRANCHES.

NOTE.—While gladly publishing in these columns the views of members of the various Branches of the Agricultural Bureau, it is pointed out that the Department does not necessarily endorse all the opinions expressed.

Bimbaya.

This branch of the Bureau met on 4th October, when papers were read by Mr. Geo. Alcock on calf-raising, and by Mr. S. Simmons on farm book-keeping.

CALF-RAISING.

Mr. Alcock pointed out the importance of having both sire and dam constitutionally sound. A sire whose progeny were tractable, and took readily to hand-feeding, would contribute to the rearing of vigorous calves. As the outcome of practical experience, Mr. Alcock's method was, not to take the calf from the mother till a week old, then to feed twice daily on whole milk for another week, and substitute skim-milk gradually till the

diet was entirely skim-milk. For the first fortnight there was always a danger of calves contracting scour, but after that there was very little trouble. As a preventive of scour, he advised feeding regularly, and having the milk of even temperature and quantity. A warm, clean shed should be provided during winter and spring, and a sunny paddock. Care should be taken to have plenty of shade during hot weather. Sun-baked calves become a prey to scours and other disorders. Calves with scour should be isolated, and all utensils used in feeding kept thoroughly clean. Cleanliness was a big factor in the matter.

They should be fed from a bucket for the first month, and afterwards they could be fed in batches from dishes. A good feeding-stand could be made by sinking a block in the ground to a height sufficient for the calves to feed from. To the top of this a dish should be nailed—an old leaky dish for preference. The old dish would hold a sound dish in position, and admit of it being removed and washed daily. Feeding from wooden troughs and all such vessels was likely to breed disease, particularly so in the case of wooden troughs, which could not be cleansed thoroughly.

Other diseases to which calves were subject were Black-leg, Black-lung (so-called), and another ailment which caused considerable frothing at the mouth. The two latter seemed to be caused by uncleanliness, and Black-leg, a disease which attacked strong calves and young stock, could almost always be cured by inoculating with garlic, and changing the pasture.

Calves were subject to three kinds of scour, viz., Black, Blood, and White. Black, scour was usually followed by Blood scour, and if taken in the early stages it could generally be cured by scalding the milk, and adding flour reduced to a paste with boiling water. Small doses of castor oil should also be given. If badly affected, dosing with oil and allowing the calf to draw whole milk direct from the mother for a day or two, often had the desired effect. White scour sometimes attacked the calf before it was taken from the mother, but chiefly during hand-feeding. It was said to be caused by germs. Doses of oil, and permitting the calf to draw its food from the mother, were beneficial. Pens should be kept in as sanitary a condition as possible, and lime used freely.

There were numbers of calf foods on the market, but none of them had come into general use. Molasses was an excellent calf food, but should not be fed to very young calves, as it would cause stomach disorders. During a dry season, Mr. Alcock had reared a herd of sixty calves practically on molasses and water, by mixing a pint of molasses in five or six gallons of water, and feeding to seven or eight calves twice daily. It was a useful addition to skim-milk even when there was ample milk available.

The paper was followed by a lengthy discussion. It was finally agreed that while all the remedies extant effected cures in isolated instances, the mortality among calves was still abnormally high.

DEPARTMENTAL NOTE.—As regards Blackleg, the Chief Inspector of Stock states that inoculating with garlic is now considered empirical, and not according to latest scientific knowledge. The preventive inoculation for Blackleg is now done with Blacklegoids and Blacklegines, attenuated forms of the virus.

Blacktown.

The monthly meeting of this branch was held on 5th October, when Mr. James Burns presided. A lengthy discussion took place amongst members regarding the lantern lecture on the Murrumbidgee Irrigation Areas, delivered by Mr. J. W. Ferguson, of the Water Conservation and Irrigation Commission, on 25th September last. The opinion was unanimously expressed that the lecture was a highly interesting one, and that it could have been lengthened with pleasure and profit.

At the monthly meeting on 2nd November it was resolved to establish a library on the lines suggested by the Department, and a programme committee was appointed to prepare a syllabus for the ensuing year.

Bloom Hill (O'Connell).

At a meeting of this branch on 18th September, a paper was read by Mr S. McKibbin, of which the following is a resumé :—

The Breeding of General Utility Sheep.

In the production of a dual-purpose sheep the result would be affected by various considerations, such as climate and rainfall, the description of country, and methods of farming. As some of the crossbreds were voracious eaters the supply of food was an important factor, and the question of the most profitable dual-purpose sheep depended to a great extent on methods of agriculture, it being essential that sufficient feed should be available in a severe season or in times of drought. Climate was an important factor in determining the most suitable type. Thus the Merino was adapted to the west, various crossbreds were suitable for the tablelands, whilst breeds like Romney Marsh would probably do best on the coast.

From his own experience he favoured the Lincoln-Merino cross as the most suitable dual-purpose breed for this district. The ewe lambs produced by crossing a Lincoln ram with a Merino ewe would form a basis from which the breeder could work in whatever direction he desired. By using the Lincoln for the first cross the longevity of the ewe progeny was assured. Only pure-bred strains of Merino and longwools should be used, or nondescripts would result.

The progeny of the Lincoln-Merino ewe, mated with a Lincoln sire, would be a model general-utility sheep, combining a good carcase with a good quality wool. Mating the Lincoln-Merino ewe with a Leicester ram would produce finer-boned sheep with fleece of less value. If a Down ram were mated with the Lincoln-Merino ewe practically only carcase would be obtained, and the progeny would be of little value as store sheep in a dry season. The aim of the breeder would doubtless be influenced by his type of country, situation, and proximity to markets, all of which were important factors in determining the most profitable dual-purpose sheep. The importance of using well-bred sheep to breed from could not be emphasised too strongly. Pure-bred rams would ensure an even flock.

Replying to questions, Mr. McKibbin stated that inbreeding (using a ram on his own progeny) was very inadvisable. While it might result in more wool, it would have the effect of weakening the constitution.

Carlingford.

On 24th September, Mr. J. Hadlington, Poultry Expert, gave a lecture under the auspices of this branch. There was a record attendance, about 100 being present.

The Breeding and Rearing of Chickens.

The lecturer pointed out that the primary necessity for successful chicken rearing was strong, vigorous parent stock. He emphasised that this aspect of the matter should receive attention months before the first breeding egg was laid. Weakness in the parent stock would most certainly be reflected in weak progeny, and it was stated that this was one of the most prolific causes of "dead in the shell," for which so many theories were advanced. Other factors to be attended to were proper feeding of the stud birds and sufficient exercise. Only eggs of normal shape and size should be hatched, discarding all that were too small or too large, or of abnormal shape. Slides were thrown on the screen illustrating this part of the subject.

Mr. Hadlington dealt in detail with points to be observed in both natural and artificial incubation, this aspect being passed over lightly as being only incidental to the main discussion. Among other slides, he showed a suitable style of incubator-house that could be built at a small cost and would be found satisfactory.

Slides were also shown of the various kinds of coops used for brooding chickens under hens, and the lecturer went on to say that broody hens were, for those working on a small scale, far preferable to a bad class of brooder, a great many of the latter being death-traps to chickens. He showed how a number of hens set at one time could be utilised for brooding chickens coming from the incubators, the practice being to give fifteen to twenty chickens to each hen. This could be accomplished by taking the eggs out of the incubators a day or two before they were due to chip, and allowing the hens to finish the hatching. In this way quite a large number of chicks could be reared, and it was incidentally stated that the lecturer raised his own first 600 chickens in this way. Mr. Hadlington then illustrated various types of brooder-houses, and different kinds of

brooders. One point he strongly emphasised was in regard to the size and aspect of the brooder-house. In the first place, he would select an eastern aspect. In the dimensions of the brooder-house, width was a very important consideration; it should be at least 13 feet (if 14 feet all the better), which should be apportioned as follows:—4 feet passage at back of the brooders, 2 feet for width of brooders, and 8 feet inside runs. He preferred brooders oblong in shape rather than square, the idea being to have them built 4 to 5 feet long by 2 feet wide, the runs being the same width as the length of the brooders. These brooders would accommodate from 75 to 100 chickens for a start and, of course, comparatively less as they grew older. The idea of a brooder-house having runs on both sides was deprecated, it being obvious that the chickens must be exposed, under this dual-run system, to either southerly or westerly winds, only a little of which often spelt disaster. The houses should be 8 feet 6 inches high in front, sloping down to 6 feet at back. Any length up to 50 feet was a good size.

Turning to the question of feeding chickens, Mr. Hadlington gave it as his experience that the best development was not obtained by all-dry feeding. He was particularly opposed to dry mash feeding for chicks, as the same development could not be secured as with the semi-wet mash (mixed with milk for preference) and a small amount of chicken mixture or crushed grain to make up the ration. The lecturer pointed out the different methods of rearing, particular attention being given to the colony system now in use at Hawkesbury Agricultural College. Keen interest was taken in the explanation of the way in which the chickens are taught to locate the house to which they belong, that is, by the use of light movable batten hurdles, covered with 1½ inch mesh wire-netting. The framework of the hurdles was of 3 inch x 1 inch hardwood. The construction of houses on the continuous system was illustrated and described in detail, as were semi-detached and detached houses. Methods of economy in the construction of houses and runs were also pointed out, and the handling of birds on free range and other systems were described.

At the close of the lecture, a general discussion was held. Many questions were asked on different aspects of the poultry industry, to which the lecturer exhaustively replied. A hearty vote of thanks was accorded to Mr. Hadlington for his interesting and instructive lecture.

A highly successful demonstration of summer pruning was given by Mr. J. G. R. Bryant, Assistant Fruit Expert, on 29th October, at the orchard of Mr. F. C. Cox, Carlingford.

Mr. Bryant dealt in detail with the handling of the young tree to promote early fruit spurs, and illustrated the great advantages of summer pruning to supplement the winter pruning. Various kinds of stone and pome fruit trees were dealt with. Many questions were asked, and at the conclusion of the demonstration a hearty vote of thanks was accorded Mr. Bryant.

Collie.

The monthly meeting was held on 30th October, when Mr. E. Murray reported to those present details regarding the results obtained in the loca Farmers' Experiment Plots.

Coradgery.

The monthly meeting of the Coradgery branch was held at the residence of Mr. Walter Brown, on 16th October, Mr. W. E. Tayler presiding.

Two interesting papers on the lessons of the drought were read by Mr. W. E. Tayler and Mr. M. J. Kelk.

Lessons of the Drought.

Mr. Tayler's paper read as follows:—

All of us who have been on the land for the best part of our lives have had many sad and expensive lessons of droughts, but whether we have learned sufficient from our experiences to make us prepare for inevitable similar recurrences is very questionable. I am afraid that once we have ample rains and the outlook is good, we are all more or less apt to forget about the losses sustained, and to imagine that we are in for a run of

good seasons. Probably this is because practically every man who stays on the land for any length of time, necessarily becomes an optimist. But we cannot get away from the fact that droughts of more or less severity have to be faced every few years, and we must endeavour to learn from experience. Droughts emphatically teach us the following lessons, viz. :—

(1) Not to overstock.
(2) Not to keep a rabbit on the farm.
(3) To conserve more water than you think will ever be required.
(4) To conserve fodder.

To deal with these in order, I do not advocate stocking so lightly as to provide against natural feed running out in prolonged droughts; for to my mind on small areas of high priced land this is not a payable proposition. But I would say, stock lightly enough to avoid shortage in comparatively short dry spells and depend on conserved fodder for longer ones. I would strongly urge the obvious advisability of the complete eradication of rabbits on the farm. I can say without hesitation that one acre without rabbits is equal to three acres with rabbits, and this is especially realised in times of drought. Many of us before the recent drought thought we had enough water stored to see us through nearly any dry period, but found to our cost that such was not the case; consequently we must have more tanks and see that our old ones are kept clean. With moderate stocking, no rabbits, plenty of water, and a liberal supply of fodder, most droughts can be faced without much fear As regards the conservation of fodder, I would like members to consider well the value of ensilage. On Adavale we have just completed two pits, estimated by measurement to contain 300 tons, made from sixty acres of wheat crop. The actual cost, exclusive of sinking the pits, is as follows :—

Discing stubble land	1s. 0d.	per acre.
Drilling...	6d.	,,
Horse feed	4s. 0d.	,,
Seed	4s. 0d.	,,
Sundries	6d.	,,
	10s. 0d.	,,

The sixty acres thus cost	£30
Cost of cutting with mower, raking, carting to pit, and covering, wages and rations (harvest rates) ...	47
Hire of waggon and repairs..	5
Total	£82

or, a little under 5s. 6d. per ton.

According to authorities, a crop that will yield one ton of hay to the acre will give three tons of ensilage. Personally I think it gives more; but let us say three to one, which means the sixty acres would have made 100 tons of hay, and I venture to say, at the same rate of wages, no one could cut with binder, stook, stack and thatch 100 tons of hay for £52, and when it comes to keeping for several years, ensilage scores considerably, as there is no danger of damage by fire or rain, or waste by mice and other causes.

Now we come to the question :—Which is the greater asset, 100 tons of hay or 300 tons of ensilage? As a marketable commodity, hay undoubtedly, and for working horses ensilage does not count; but for feeding sheep and cattle during dry periods I should say 1 ton of ensilage is equal to 1 ton of hay, and in the cases of ewes and lambs 50 per cent. better. Therefore, for this purpose every £1 invested in ensilage will give you fodder three times the value of an equal amount invested in hay, if not more.

Mr. M. J. Kelk wrote :—

That Australian farmers in times of plenteous or even moderate rainfall are prone to forget the drought of even the recent past is proverbial. And the fact that so high a condition of prosperity prevails throughout Australia in spite of droughts, only serves to emphasise the necessity of learning the lessons the droughts teach. There is no doubt that much of the havoc wrought by drought in this district could be averted, especially since the land is more and more being occupied by comparatively small holders. When we cast back in memory to the losses and inconvenience one has seen and suffered—flocks of valuable ewes reduced to half by death, herds of cattle decimated or altogether lost, working horses sent away to suffer a bare subsistence at a time when they should be at home well fed and at work on the fallows, waggons on the roads loaded with tanks of water for household as well as stock purposes—one is forced to the conclusion that half the energy that is spent in times of stress applied in times of plenty, as the result of a methodically formed and matured plan, would go far to eliminate altogether

the possibility of a recurrence of these distressing and costly conditions. All the above has been written and said and sung over and over again in every journal or magazine that caters for the rural reader, and yet in the aggregate the teachings are ignored. But because they have been ignored for all this long time, it does not follow that they will never be heeded. The Australian farmer will awake and arise, and, working hand in hand with nature, whose handiwork the drought is, will surely learn how to reduce the misery and suffering and inconvenience and labour and costliness of drought times to a memory of a bitter and benighted past. There is no necessity here to mention the measures required to be taken to bring about the desirable change. We all know them, as well as many other things pertaining to farming science which we know how to do—but do not do.

Nothing then remains but to ask the question "Why," and to supply the answer. Why do not farmers learn the lessons of the drought? The answer is "They do, but do not act on them." The question then is, "Why don't they act upon them?" The answer is, "Because they lack initiative." Power, time, intelligence, courage, energy, incitement, knowledge, materials, opportunities, even will, all of these we have, but one thing is lacking—initiative. Let one turn up his dictionary and he will find "Initiate, v.t., to make a beginning; v.i., to perform the first act." "Well begun is half done," and in no case is the incidence of the old adage more pronounced than in this matter. Has a farmer ever seen on his own farm a vigorous growth of dirty crop, or even herbage, and said to himself, "I wish I had that in a pit of ensilage." Yes, hundreds of times. Members of this branch have the object lesson of why and when and how to make ensilage constantly before them on some few holdings, notably that of our chairman, who has contributed two highly instructive papers on this subject, and has repeatedly invited all and sundry to go and see the ensilage being put in, has explained the method, and has carefully tabulated the cost, and, in the instance of the last drought just passed, the results achieved.

The paper closed with an appeal to farmers to take advantage of opportunity to construct a silage pit, and to fill it the first time there was material suitable for the purpose.

DISCUSSION.—A general discussion followed, and members were unanimous in declaring that conservation of water was of first importance. Mr. T. FRECKLINGTON said he had just finished cleaning out his tanks with a silt scoop, and had experienced no trouble at all. He strongly advised members not to leave this important operation until the tanks were half empty and boggy. With full tanks the work was much easier for the horses, and the waste of water was of no consequence.

Mr. Tayler's figured cost of ensilage at 5s 6d. per ton was a revelation to members, and as regards that gentleman's management at Adavale, the charge of lack of initiative does not apply.

A number of members intimated that they were making ensilage either in pit or stacks, so that in this connection alone the benefit of the Bureau is apparent.

Cundumbul—Eurimbula.

The annual meeting of this branch was held on 23rd October, when the following gentlemen were elected as office-bearers for the ensuing twelve months:—Chairman, Mr. F. T. Meurant; Vice-Chairmen, Messrs. L. B. Meurant, Harold A. Chappell, and Thomas M. Berney; Hon. Secretary and Treasurer, Mr. Joseph D. Berney.

A paper, of which the following is a summary, was read by Mr. T. Berney:—

HAYMAKING.

The first thing to do, said Mr Berney, was to see that the binder was in good working order, by removing all worn parts and replacing them, and cleaning off all grease and dirt. Oil holes should be cleaned and filled with clean, light oil. All nuts, &c., should be well screwed up and, above all, the knife should be keen, as it was impossible to make a clean cut with a blunt knife. The best time to cut was when the crop was very green, and the sap in the straw, and before the grain had formed, as there was no danger of "fevering" horses if they were fed with grainless chaff. Another advantage in cutting green was that mice would not damage green hay in the stack nearly so much as when grain was present. Oaten hay should be left a little longer than wheaten—until the top grains were nearly ripe, and the straw a purple color. Care should be taken not to tie oaten hay too tight, as there was some danger of the inner portion of the sheaf becoming mouldy, and causing trouble after stooking

Wheaten hay should be stooked as soon as possible after being cut. He preferred round stooks of about fifteen sheaves, and the stooks should stand from nine to fourteen days, according to the weather. It was a good idea to cap the stooks; this was done by taking hold, just above the band, of a handful of hay in one sheaf, and passing it under the band of another sheaf. These were placed heads downwards on top of a stook. The result would be the stook would set solid and would stand a lot of rough weather.

DISCUSSION.—Members generally agreed with the points mentioned in the paper, though some favoured wheaten hay being cut at a little more advanced stage.

Mr. F. T. MEURANT did not consider it likely that much damage would be done by tying sheaves tight, even though they did mould a little, provided the hay was for home use. He once stacked hay freshly cut, putting a load of dry in the stack, and then a load of green. The whole stack became discoloured, but the feeding value did not seem to have diminished in any way, as horses seemed to eat the chaff as well as any other kind. He only did it once, however, under special circumstances, and did not recommend the practice.

Forest Creek.

Mr. J. W. Mathews, Sheep and Wool Expert, visited this district on 28th and 29th October. On the afternoon of the former date, he delivered an address at Mr. W. Roberts' woolshed. Handling the rams from Mr Roberts' flock, Mr. Mathews explained how they could be judiciously used in obtaining uniformity in the wool of the flock later on. At the conclusion, many questions of interest were answered by Mr. Mathews. He afterwards classed a few of Mr. Roberts' ewes, showing the class of ewe to mate with the different rams, and so bring about uniformity in the wool.

On 29th October Mr. Mathews visited other farmers' places in the district, offering further suggestions.

Henty.

A demonstration of the preparation of farmers' wool for market was conducted by Mr. J. W. Mathews, Sheep and Wool Expert, under the auspices of this branch, on 5th October.

The demonstration was held at Mrs. Taylor's Emerald Hill woolshed, where a number of sheep were yarded for the purpose. Considerable interest was taken in two rams that were in the pens—one being a small sheep with very fine wool, and other a bigger sheep with slightly coarser wool. To prove which had the heavier fleece, both were shorn and the fleeces weighed. That of the smaller sheep weighed $7\frac{3}{4}$ lb., and that of the bigger one $9\frac{3}{4}$ lb. The heavier sheep was thus the more profitable, notwithstanding the difference in the quality of the wool.

Kellyville.

A meeting of this branch was held on 6th November. The subject for discussion was the growing of vegetables between the rows of young fruit trees.

VEGETABLE CROPS IN YOUNG ORCHARDS.

Mr. Joseph NUTTER contended that growing vegetables between rows of young fruit trees was not injurious to the trees, provided proper methods were employed and careful selection made of the species of vegetable grown. The greatest care must be taken when planting for the spring growth, as that was the time when the conservation of moisture in the soil for the benefit of the young trees was most essential. If proper and sufficient manure was added to the soil when planting out the vegetables, the ground was in no way impoverished.

Mr. Herbert JAMES said that, after giving the method a very fair trial when planting out his own young orchard, he had come to the conclusion that if the grower could stand the financial strain of waiting for his trees to come to fruiting age, it was undoubtedly

better to have no inter-planted crop in the young orchard. The vegetables would rob the trees of moisture at the most critical times, even when planted 3 or 4 feet away. They were also very often in the way of proper cultivation of the orchard when it most needed attention.

Mr. FIRTH said his experience was also against the method.

Mr. H. REID said the growing of the root species—such as turnips and potatoes—in the autumn of the year, when the district usually got good rains, did not injure the trees, providing the inter-planted crop was got away in plenty of time for working the ground after the winter, to conserve moisture for the trees during the approaching spring.

It was evident that nearly all present condemned the practice as being injurious and financially unsound.

Little Plain.

A meeting of this branch was held on 23rd October, when a paper was read by Mr. H. Taafe, from which the following is extracted :—

ORCHARD NOTES FOR INVERELL DISTRICT.

Visitors to this district often remark that never elsewhere have they seen fruit so generally grown. Almost every homestead here has fruit trees of some kind. Some districts that we know of specialise in citrus ; others confine themselves to apples, pears, and cherries. The stone fruits will thrive almost anywhere. Here we can profitably grow all the foregoing fruits, though not always in the same orchard. The soil may be, and generally is, suitable ; but to guard against heavy and late frosts, we must confine citrus trees to high lands, while apples and pears do better on low. Some of the best apples at the last Inverell show were grown on black soil on low-lying land, where citrus trees would fail. Grape-vines are fairly susceptible to frost ; a cold winter does them no harm, but a late frost after the sap has risen is disastrous. Cherries are rather uncertain, and I believe the texture of the soil has much to do with this ; they appear to prefer a loose soil. The Mazzard, which is chiefly used as cherry stock, will not penetrate a stiff subsoil. We find the plough tearing up the roots, and this is followed by a troublesome growth of suckers. The tree will often set fruit and then shed the bulk shortly afterwards. Peaches do well in the stiff soils, and perhaps if we used them as cherry stocks instead of the Mazzard matters would improve. Most of the early fruit growers in this district started by planting some seedlings of anything that came handy, the result being some good trees, some just passable, but mostly worthless. Following on this we placed orders with the nurseries. We perhaps knew the names of some good trees, and then ordered more on the chance that some of these also might be good. This evolutionary development has brought us to the present, when the quality of our fruit, generally speaking, is second to none. I advise fruit-growers to bud any inferior trees from a better variety. This should be done in December. Similarly grape vines should be grafted in the first week of September.

From early spring till winter the orchard must be thorougly cultivated, and kept as free from weeds as possible. This applies as we know to other crops. Let the winter weeds grow, and plough under in August to supply humus to the soil. Perhaps it would be better to sow rape for this purpose.

Many orchardists spray everything as thoroughly as they plough and prune. So far I have not found this necessary, but by carefully watching for the first signs of disease, and promptly treating it before the tree or vine has become weakened by the attack, I have found both fungus and insect pests easily controllable. Fruit-growers should be careful in making up any spraying mixtures, or they may be useless or even harmful. Bordeaux mixture is the ideal fungicide if properly made so as to form a copper hydrate. Too much free copper will burn the foliage.

As insecticides I prefer the emulsified oils. The proprietary articles save much trouble in mixing.

Matcham.

A meeting of this branch was held on 23rd October, Mr. George Pritchard presiding. An instructive and interesting paper was read by Mr. M. Spina.

CITRUS CULTURE AND LEMON CURING.

MR. SPINA dealt first with the planting and care of the young trees up to the bearing stage. To leave the lemon on the tree until full grown and yellow, was, in his opinion, wasteful and unprofitable, as the fruit had then to be sent away regardless of market conditions. The method advocated was to gather the fruit when about three to four ounces in weight, or a little more than half ripe, using a ring as a gauge to

ensure a uniform size, and cutting with a sharp knife. In Italy a knife specially made for the purpose was used. A fine day should be selected for picking, and the lemons should be handled as carefully as eggs would be, permitting neither scratching nor bruising. They should then be wrapped in an absorbent paper, and packed in boxes placed in the fruit shed out of the sun and inclement weather. The trees should be gone through every two weeks, and all fruit up to the required size gathered and treated as aforesaid. Lemons so treated would keep for from five to seven months, and at the end of that period would be in perfect condition, and far superior to a lemon left to ripen on the tree. The main points to be observed to ensure success were:—(1) The proper kind of paper (the kind preferred by Mr. Spina he had been unable to procure in Sydney), (2) regular picking in fine weather (damp weather to be avoided), (3) very careful handling.

Mr. W. SHARPE gave a very useful demonstration of pruning and planting the orange tree.

Miller's Forest.

The annual meeting of this branch took place on 9th November.

The Secretary's annual report showed that although the branch was started in a very bad time, satisfactory progress had been made. During the year eight meetings had been held, and the attendances had been very satisfactory. The lecture delivered by Mr. Wigan, Dairy Instructor, was mentioned as particularly valuable, and as of having been the means of leading many dairy farmers, who had previously been delivering second grade cream to improve the quality of their produce to first grade. Members were urged to make a canvass during the ensuing year to increase the membership.

The membership fee for the coming year was fixed at 1s. per annum per member.

The election of officers took place with the following result:—Chairman, Mr. J. Priddle; Vice-chairman, Mr. T. Cunningham; Treasurer, Mr. J. Broderick; Hon. Secretary, Mr. A. J. O'Brien; Programme Committee, Messrs. J. Priddle, G. King, and A. J. O'Brien.

Sorghum seed which had been received from the Department was handed to Mr. T. Cunningham for him to plant, as his land was suitable for sorghum. Mr. Cunningham said if the crop were successful he would distribute the seed amongst the members of the branch.

The members who had sown the cereals received from the Department, were able to exhibit some very fine samples. It was decided that the Chairman should make up a box of samples, and forward it to the Director of Agriculture.

The fox pest was mentioned by several members, numerous losses of poultry being reported, and it was agreed that a fox hunt should be arranged.

Mittagong.

At a meeting of this branch, on 23rd October, at which Captain Fairley, of Joadja, presided, a most interesting lecture on "The Marketing of Fruit" was delivered by that gentleman.

THE PREPARATION AND MARKETING OF FRUIT.

Captain Fairley said the results obtained during a long experience here and in other markets showed that too much care and attention could not be focussed on the subject, the manner in which fruit is packed and the time at which it is transported to market

being of vital interest. With increased orchard acreage and keen competition, orchardists found that such care often meant a difference in prices equal to the difference between pence and shillings. If a grower had a brand or a name on his cases, such brand or name should always represent quality; otherwise owners should not lay all the blame on agents when they could not secure the prices for similar fruit that they got for more careful and fortunate neighbours. No agent could get market prices for a case of fruit that was slack and poorly packed. Fruit should always have an attractive appearance when the case was opened, and white paper and wood wool were strongly recommended for this purpose in place of newspaper so frequently used. With many buyers first impressions in selecting a case of fruit had much weight, and consequently influenced the prices obtained.

Special reference was made to the proper time for picking and method of packing and grading cherries and other soft fruits, the use of wood wool being expressly recommended for them. Apples and pears were also referred to, and the gradual development of the American fruit export trade to Europe was most interestingly described, and also the increasing American fruit export to New South Wales, which ought to be keeping its own surplus fruit in cold storage to meet the out-of-season shortage. The imports this year from America alone were 200,000 cases of fruit at least. The advantages of pulping surplus fruit were discussed, and it is not improbable that a future paper on this subject may bring the matter more into prominence and show it to be profitable enough for local enterprise.

A hearty vote of thanks was tendered to Captain Fairley for his most interesting and profitable paper, which, it is hoped, will be the forerunner of others.

Orangeville.

At a meeting of this branch on 21st August a paper on house painting was read by Mr. Norman Hoskisson. A number of useful suggestions were made. The paper advocated buying white lead and oil and mixing the paint at home; the method might be a little dearer in the first instance, but it would prove the cheapest in the long run.

Ponto.

A meeting of this branch was held on 24th September, when the following gentlemen were elected office-bearers for the ensuing twelve months:—Chairman, Mr. L. A. Stuart; Vice-Chairmen, Messrs. A. Knowles and A. T. White; Hon. Secretary and Treasurer, Mr. A. D. Dunkley.

Ringwood.

Mr. J. W. Mathews, Sheep and Wool Expert, gave a demonstration of wool classing and skirting on 26th September, to a number of members of the above branch. Mr T. J. Gorman, of Plentyana, kindly provided sheep and fleeces for the demonstration, which was held in the afternoon, and which was much appreciated by the farmers present.

At night Mr. Mathews delivered a lecture, showing some fine illustrations of the different types of sheep, and advised every farmer to breed with a definite object in view. He strongly emphasized the fact that a heavy fleece and a good mutton carcase could not be obtained at the same time. He recommended the farmers of Riverina to start with large-framed Merino ewes and a Lincoln ram to get flock ewes, and then cross these with a ram of the Down breed for lambs for export. He also strongly advised a trial of the Dorset Horn ram, which he claimed produced a very early maturing lamb. To produce lambs for the fat lamb market from pure Merino ewes he advocated the Border Leicester ram.

Sackville.

A meeting of the above branch took place on 29th October, when the report and balance sheet for the previous twelve months were read and adopted.

The Secretary has forwarded a paper which was read at the September meeting by Mr. G. Turnbull, and from which the following extracts are taken:—

Book-keeping for the Farmer.

In these days of uncertainty and adverse seasons, thrift is necessary if we wish to place ourselves in a good financial position, and one of the best forms of thrift for the farmer is book-keeping—a keeping of all transactions correctly. This has proved successful in relation to commercial firms, and should prove equally so with the agriculturist.

Probably the man on the land imagines he is quite capable of doing all transactions without the aid of books, but could any large firm carry on business without a system of book-keeping? The agriculturist is certainly more favourably situated than these, and may manage without books, but it is false economy, and the man who keeps his accounts correctly certainly has a great advantage over the man who does not. The keeping of accounts should apply to all the undertakings on the farm, whatever form they may take. The cost of sowing and harvesting of all crops, the cost of production of milk and butter (in the case of a dairyman), the cost of the poultry, and of anything that is produced on the farm should not only be taken in a general way, but should each be taken on its own merits.

This is where the real benefit of book-keeping comes in. Some people, perhaps most people, would be satisfied to know their cash book showed a credit balance, but if all the takings are bundled together the farmer does not know which crop or other undertaking is paying. If the cost of everything is properly noted and apportioned to the different parts of the farm, or whatever the farmer may put his hand to, it is possible for him to detect the line that is not paying, and to act as the circumstances direct. He should set his mind on one thing—getting the maximum result from the minimum of labour.

Other than knowing which crop pays best, there are advantages to be gained from book-keeping on the farm. We all know what the sensation is like which results from a glutted market. Although the orchardist, especially one who goes in largely for summer fruit, has little or no choice as to when he may market his fruit, this does not apply to all branches of agriculture. There are times in the year when prices are almost invariably high or low, as the case may be. To cope with this we are advised to plant often and keep up a regular supply. This practice is not always convenient for several reasons, and may be made unnecessary by a close observance of prices obtained throughout the year. This plan I know to have been very successful, and strikes me as being a very much easier and more successful way than continually growing crops with the hope of "striking it lucky" sometime or other. Luck is a thing which rarely comes the farmer's way, and if the farmer wishes to be successful I would advise him to keep accounts of all his doings, dropping all unprofitable lines and keeping those only from which he obtains the best results.

Temora.

At the October meeting of this branch the subject set down for discussion was "Stack-building and the correct time to cut hay." The subject was opened by Mr. J. T. Warren.

Stack-building and the Correct Time to Cut Hay.

Mr. Warren said that although he did not profess to be an expert stack-builder, he had had a good deal of success in that direction. His first lesson in stack-building had come from the old country, and the principal feature in the system followed was to begin the stack by making a stook in the centre of the stack and gradually extending to the outside of the stack, keeping the sheaves as near the upright position as it was possible to build upon. In continuing the tiers upwards, the centre or crown of the stack was always kept as high as it was safe to build upon without causing the edges to slip away. This was a good method to keep the rain out of the stack, but one could never be sure that the stack would retain the shape given it in building, on account of a tendency to settle down more in some parts than others through a partial slip in some of the outside rows. He had, many years ago, changed his method, as he believed the straw was too hard in this country to bind well in the stack under the conditions referred to. He then adopted the method of first laying the outer row on the ground, then building inward, keeping the heads on top of the last row with the butts on the ground. Before building any further on the outside edges of the stack, the centre was filled considerably higher than the outside, but not enough so to cause any tendency to slip. On getting to the eaves the last two tiers were placed to project slightly outward

beyond the sheaves below. Before beginning to draw in the sides to form the head, the centre of the stack was built up so that the outer row of sheaves had a good slope outward. The laying of the sheaf at this angle made it necessary to draw in the outer sheaves in each tier a bigger step than if the sheaves were lying flatter, and caused each line of sheaves to be seen distinctly when the stack was finished. He had found it very effective in keeping out the rain.

He drew attention to an article in Farmers' Bulletin, No. 101, on stack-building, as practised at the Wagga Experiment Farm, particularly to the system adopted in forming the roof by placing all the sheaves lengthwise on the stack and putting a layer of thatch sheaves over the roof in such a way as to have each row of sheaves bound by placing the heads between the tiers forming the head. This method being quite novel to members, a good deal of attention was given to the article referred to. Mr. Warren was inclined to think the idea a good one.

Some years ago he made an experiment in connection with the question of choosing a position to build a stack, the idea being to save waste through the bottom of the stack absorbing moisture from the soil. He chose an open space between green trees, with the idea that, the ground being full of green roots, the trees could be trusted to draw away all moisture before it would get up into the stack. He was well pleased with the result of the experiment. The first stack was built on the ground a few days after heavy rain, but after more than twelve months the bottom sheaves came out with very little discolouration. With regard to cutting hay, he favoured cutting some fairly green and some with the grain fairly filled and mixing it in the stack.

Mr. DONALDSON said he had abandoned putting an upright stook in the stack many years ago, as it caused the sides of the stack to sometimes slip. It was best to put timber down first, then build the outside first all round. He favoured oval ends to the stack instead of square. He never built with a very big heart in the stack till up to the eaves, when he kept a good heart in it. He had been building for many years, but he had never had a wet stack.

Mr. DAHLENBERG advocated building with a fork. He did not favour using timber as a foundation, as it induced mice to get into the stack. He had always put a bedding of straw about 18 inches deep. Recently he had built a stack on straw, and though the water was at times lying round the stack, when used he had not had to throw away one sheaf. In building, he laid the outside sheaves loose and the middle of the stack close and high. This allowed the outside to settle down more than the centre, causing the drainage to be always outward. The capping was one of the important points, and he preferred thatching with the wedge on the roof as narrow as possible. If too wide, water got in through the middle of the stack. With regard to haymaking, he considered that stooking was more important than cutting. In New Zealand they placed the side on which the binder ties the knot on the outside, as this runs the water off.

Mr. SCHRUHM preferred large stooks and not to interfere with them until removed to the stack.

Mr. DONALDSON preferred leaving the sheaves on the ground for a day before stooking.

Mr. MALLINSON thought if a farmer cut a great deal for hay it was necessary to build big stooks. He always preferred to build the stook properly, and not so that it would be knocked down by the wind. He thought if anyone wanted to cart in quickly a long stook was preferable, but in some cases it was better to have round ones. If hay was cut for Sydney or Melbourne markets it should be cut green, as the colour was the main thing looked for by horse-owners, who put the grain in when feeding the horses. For their own use, farmers preferred to get the grain in before cutting.

Mr. DONALDSON agreed that it was not advisable to cut oats for hay until the grain was well filled. For wheaten chaff he preferred cutting when the grain was past the milky stage.

Toronto.

This branch held its usual monthly meeting on 6th November. The following gentlemen have been appointed office-bearers for the ensuing year :—Chairman, Mr. John T. Burten ; Treasurer, Mr. John G. Desreaux ; Hon. Secretary, Mr. P. F. Newman.

Wagga.

A meeting of this branch was held on 20th October. Members present were very enthusiastic, and resolved to co-operate with a view to ensuring the success of the branch in the future.

The following gentlemen were elected office-bearers :—Chairman, Mr. Wm. Moore ; Vice-Chairman, Mr. W. J. Beck ; Treasurer, Mr. F. Poile ; Hon. Secretary, Mr. E. Crouch.

LIST OF BRANCHES.

Branch.	Hon. Sec.
Albury	J. Brann, Racecourse Rd., Albury.
Baan Baa	P. Gilbert, Baan Baa.
Balldale	H. Elrington, Balldale.
Bathurst	J. McIntyre, Orton Park.
Batlow	L S. Chandler, Batlow.
Beckom	Peter Grant, Beckom.
Bimbaya	E. T. Boller, Bimbaya.
Blacktown ...	R. H. Lalor, P.O., Seven Hills.
Bloom Hill (O'Connell).	C. A. McAlister, Bloom Hill, O'Connell.
Borambil	H. A. D. Crossman, "Homewood," Qurindi.
Brocklesby ...	J. Hunter, Brocklesby.
Bungalong ...	G. H. Pereira, Cowra Rd., via Cowra.
Canadian	F W. Taylor, Canadian Lead.
Cardiff	John Cockburn, Cardiff.
Carlingford ...	F. H. Harvey, Ray Road, Epping.
Cattai	A. J. McDonald, Cattai, Pitt Town.
Cobbora	Robert Thomson, Cobbora.
Collie	C. J. Rowcliff, Cow Plain, Collie.
Coobang	Benno Seidel, Coobang, via Parkes.
Coonabarabran ...	H. H. Moss, Coonabarabran.
Coradgery ...	J. Clatworthy, Millpose, Parkes.
Coraki	G. E. Ardill, Bungawalbyn.
Coreen-Burraja ...	———
Corowa	R. Dwyer, Corowa.
Courangra ...	S. H. Warland, Courangra.
Cowra	E. P. Todhunter, Cowra.
Crudine	F. W. Clarke, Crudine.
Cumnock	S. R. Reynolds, Cumnock.
Cundletown ...	S. A. Levick, Roseneath, Cundletown.
Cundumbul and Eurimbla.	J. D. Berney, Eurimbla, via Cumnock.
Deniliquin ...	W. J. Adams, jun., Deniliquin.
Dubbo	T. A. Nicholas, Dubbo.
Dunedoo	Geo. Turvey, Dunedoo.
Dural	H. E. Wickham, Dural.
Erudgere	Frank Hughes, Erudgere.
Fairfield	H. P. Godfrey, Hamilton Rd., Fairfield West.
Fernbrook ...	W. Marks, Yarrum Creek, Dorrigo.
Forest Creek ...	W. Thompson, Forest Creek, Frogmore.
Garra & Pinecliff	A. S. Blackwood, Garra, via Pinecliff.
Gerringong ...	J. Miller, Gerringong.
Glenorie	F. A. Nicolson, Glenorie.
Grenfell	A. A. Patterson (*pro tem*), Grenfell.
Gunning	E. H. Turner, Gunning.
Hay	F. Headon, Booligal Rd., Hay.
Henty	L. Eulenstein, Henty.
Hillston	M. Knechtli, Hillston.
Inverell	W. A. Kook, Rock Mount, Inverell.
Jerrara	A. O. Lane, Mullengrove, Wheeo.
Jindabyne ...	Sylvester Kennedy, Jindabyne.
Katoomba ...	W. E. Perry, Victoria Road, Katoomba.
Keepit, Manilla...	J. B. Fitzgerald, Keepit, via Manilla.
Kellyville... ...	Daniel Kearney, Kellyville.
Kenthurst ...	J R. Jones, Kenthurst.
Lankey's Creek (Jingellic).	G. J. Nichols, P.O., Jingellic.
Leech's Gully ...	G. R. Smith, Homestead Farm, Leech's Gully.
Leeton	Geo Arbuckle (*pro tem*), The Nursery, Leeton.
Little Plain ...	F. S. Stening, Little Plain, via Inverell.
Lower Portland	W. C. Gambrill, Lower Portland.
Mangrove Mountain.	A. E. Lillicrap, Mangrove Mountain, via Gosford.
Martin's Creek	P. Laney, Martin's Creek, via Paterson.
Matcham ...	W. R. Crossland, Matcham, via Gosford.
Meadow Flat ...	T. L. Williams (*pro tem*), Meadow Flat, via Rydal.
Middle Dural ...	A. E. Best, "Ellieleigh," Middle Dural.
Milbrulong ..	O. Ludwig, Milbrulong.
Miller's Forest	A. J. O'Brien, Miller's Forest.
Mittagong ...	H. F. Thresher, Mittagong.
Moruya	P. Flynn, Moruya.
Narellan	G. J. Richardson, Narellan.
Narrandera ...	James Falkner, Narrandera.
Nelson's Plains	M. Cunningham, Nelson's Plains.
Nimbin	J. T. Hutchinson, Nimbin.
Orangeville ...	C. Duck, Orangeville, The Oaks.
Orchard Hills (Penrith).	H. Basedow, Orchard Hills, via Penrith.
Parkesbourne ...	W. H. Weatherstone, Parkesbourne.
Peak Hill ...	A. B. Pettigrew, Peak Hill.
Penrose-Kareela	A. J. Bennett, "Brookvale," Kareela.
Ponto	A. D. Dunkley, Ponto.
Pyangle (Lue) ...	T. A. Sheridan, Homestead, Lue.
Redbank ...	J. J. Cunningham, Redbank, Laggan.
Ringwood ...	Wm. Tait, Ringwood.
Robert's Creek...	J. Cavanagh, Robert's Creek.
St. Mary's ...	W. Morris, Queen-st., St. Mary's.
Sackville	Arthur Manning, Sackville.
Sherwood ...	J. E. Davis, Sherwood.
Stockinbingal ...	J. Neville, Stockinbingal.
St. John's Park	J. C. Scott, St. John's Park.
Tallawang ...	Selwyn E. Hinder, Tallawang.
Tangmangaroo...	A. Thompson, Kangiara Mines.
Taralga	Dave Mullaney, Stonequarry, Taralga.
Tatham	J. J. Riley, Tatham.
Temora	J. T. Warren, Victoria-st., Temora.
Toronto	P. F. Newman, Toronto.
Tumbarumba ...	R. Livingstone, Tumbarumba.
United Peel Riv. (Woolomin).	C. J. MacRae, Woolomin.
Upper Belmore River.	M. H. Hodgson, Upper Belmore River, via Gladstone, Macleay River.
Valla	A. E. T. Reynolds, Valla, via Bowraville.
Wagga	E. Crouch, "Estella," Wagga.
Walla Walla ...	B. A. Smith, Walla Walla.
Wallendbeen ...	W. J. Cartright, Wallendbeen.
Walli	Geo. Edgerton, Applewood, Walli.
Wetherill Park	L. Rainbow, Wetherill Park.
Wollun	———
Wolseley Park ..	H. McEachern, Wolseley Park.
Wyan	C. W. Harper, Myrtle Creek Railway Station.
Wyong	Edgar J. Johns, Wyong.
Yass	———
Yetholme ...	N. D. Graham, "Bona Dea," Yetholme.
Yurrunga and Avoca.	Geo. Ragg, Avoca.

Orchard Notes.

DECEMBER.

W. J. ALLEN.

Cultivation.

THE exceptionally dry season now being experienced indicates the necessity for farmers and fruit-growers to cultivate their orchards in a thorough manner. After each rain the land should be cultivated and cross cultivated as soon as possible, and where irrigation is practised, after each watering. In addition to this, the soil around trees and vines which cannot be stirred with a cultivator should be broken up with a fork hoe. An occasional working of the ground is an advantage to keep it in good condition, even though rain should not fall or irrigation not be practised, as such a stirring will keep the weeds under, and help to maintain a proper soil mulch, which prevents an undue loss of moisture. Where Couch grass is found growing it should either be ploughed up or dug out on a hot day, so that the roots may be exposed to the rays of the sun and drying winds, which soon kill them.

Thinning Fruit.

The stone fruit crop this season is, generally speaking, a good one. In nearly every orchard trees are to be found which are apt to overbear, or which carry heavy crops every alternate year, while during the off year they set very little fruit. How much better would it be, therefore, if every means were used to regulate the cropping? To this end thinning should be done as soon as possible after the pits harden in stone fruit.

Export of Fruit.

No doubt the space for the export of fruit will be limited this season, so that arrangements should be made as early as possible for space in the boats if fruit is to be exported overseas this coming season.

Fighting Pests.

So long as Codlin moth, scale insects, and other pests are with us, it will be necessary to maintain a systematic fight to keep them in check. It is difficult to say just how many times it will be necessary to spray to keep the moth in check, but it is considered that for this State four applications will give best results. It is frequently found, when harvesting operations commence, that had another spraying been given some time in January, or early in February, the percentage of affected fruit would have been greatly reduced. This applies more especially to late varieties, such as Granny Smith, Stone Pippin, and Rome Beauty Apples.

Scale Insects.

Either fumigate or spray for the purpose of destroying these pests. Fumigation has proved to be the most effective treatment for scale insects on citrus trees. If fumigation is practised, see that it is carried out during early morning or late evening, or at night time, but not during the heat of the day. Miscible spraying oils are being largely used for the control of scale insects. Their work has not been altogether satisfactory, as in some cases growers have had good results one year, whilst the following year, under practically similar conditions, the results have been disastrous. The chief trouble seems to be from the fact that the oils are not thoroughly emulsified. Growers should, therefore, be careful to purchase only reliable brands, which give a thorough emulsion when mixed with water. Soft water is always the best to use for dilution purposes.

Fruit Fly.

All infested fruit should be regularly picked and destroyed, and all infested windfalls should be also destroyed, either by burning or boiling.

Pear and Cherry Slug.

Cherry, pear, and other trees affected with pear slug should be sprayed with arsenate of lead when the pest is showing itself. One or two sprayings will be sufficient to keep it in check.

Vine Moth.

If the caterpillars of this pest put in an appearance the vines should receive a thorough spraying with arsenate of lead.

Drying Apricots.

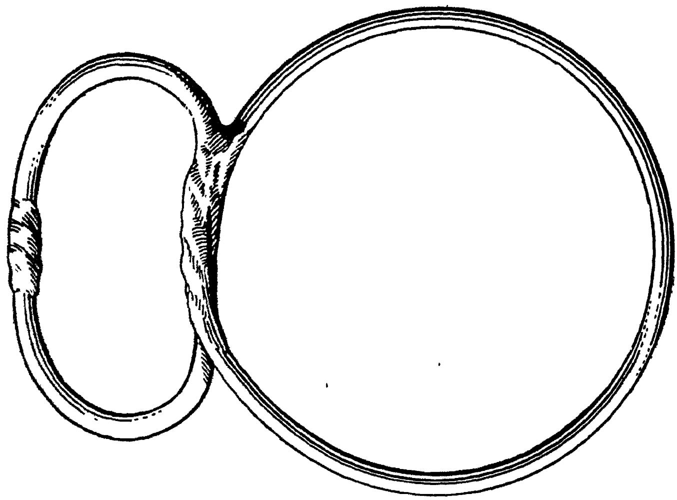
Apricot drying will commence this month. See that the fruit is properly ripe before it is picked, and immediately it is cut and placed on trays remove it to the fumigator, and keep it away from draughts and sun until it has been exposed to sulphur fumes. After it has been subjected to the fumes for about three hours the fruit may still remain in the closed room until the centre—that is, the depression made by removing the stone—is full of juice. The fruit should then be placed in the sun and allowed to remain until most of the moisture is removed, when the fruit is found to be tough but not hard.

Irrigation.

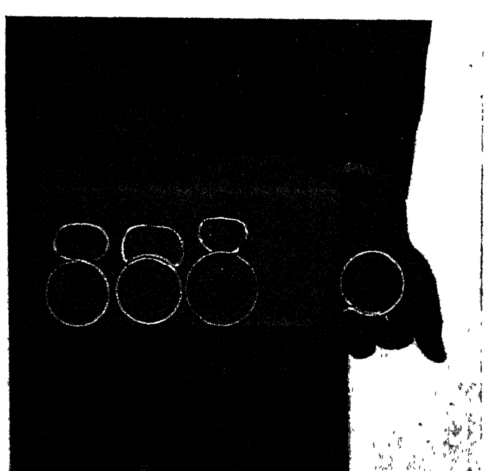
When irrigating young trees and vines see that the ground is well soaked to a good depth, but avoid flooding. Immediately the land is dry enough for the teams to work, start the cultivators and work the ground to a good depth. The soils around the trees and vines should be worked with a fork hoe.

Rings for Lemon-picking.

As a means of ensuring the picking of average-sized specimens, the rings shown in illustration are used. They are made from strong white wire, and soldered at the clip which fits over the fingers. After practice a competent picker may not require the ring, but it is easily carried, and is ready when in doubt as to the size of the fruit being clipped. The clipping of the fruit adds to its keeping qualities.



Ring or use in Lemon-picking, showing method of making.



$2\frac{1}{8}$ inches. $2\frac{3}{8}$ inches. $2\frac{1}{4}$ inches.

Rings of various sizes. The method of holding the ring is also shown.

Government Stud Bulls available for service at State Farms, or for lease.

Breed.	Name of Bull.	Sire.	Dam.	Stationed at—	Engaged up till
Shorthorn ...	Melba's Emblem (Vol. IV. M.S.H.B.)	Emblem of Darbalara (100 M.S.H.B.)	Melba 3rd of Darbalara (1058 M.S.H.B.)	Berry Farm ...	‖
" ...	Imperialist ... (183 M.S.H.B.)	Florio	Lady Nancy of Minembah.	Berry Farm ...	*
Jersey ...	Grenadin (imp.)	Attorney (9477)	Cyril's Carnation (imp.).	H. A. College ...	*
" ...	Trafalgar ...	Best Man ...	Rum Omelette	Cowra Farm ...	*
" ...	Kaid of Khartoum	Sir Jack ...	Egyptian Belle	Yanco Farm ...	*
" ...	Leda's Retford Pride.	Dinah's Lad ...	Leda's Angel..	Wagga Farm ...	‖
" ...	Goddington Noble XV (imp.)	Goddington Noble	La Franchise 3rd.	" ...	*
" ...	Xmas Fox (imp.)	Silver Fox ...	Malvoisie ...	H. A. College ...	‖
" ...	Janet's Queen IV Brighton of Coolangatta.	Brighton King of Coolangatta.	Janet Queen IV of Coolangatta.	" ...	*
Guernsey ...	The King's Mirror	Calm Prince ...	Vivid (imp.)...	Fairy Hill ...	19 April, '16.
" ...	Godolphin Moses (imp.)	Golden Hero of the Vauxbelets (1929)	Rosetta (6509)	Wollongbar Farm	*
" ...	Hayes' Fido (imp.).	Hayes' Coronation 3rd.	Hayes' Fi-Fi 2nd.	Boorie Creek ...	30 July, '15.
" ...	Claudius (imp.)	Golden Star II..	Claudia's Pride (imp.).	Murwillumbah ...	30 Dec., '15
" ...	George III ...	King of the Roses	Calm 2nd ...	Wollongbar Farm	‖
" ...	The Peacemaker	Calm Prince ...	Rose Petersen	Wollongbar Farm	‖
" ...	King of the Roses	Hayes' King ...	Rosey 8th (imp.).	Wollongbar ...	— May, '16.
" ...	Lauderlad ...	Laura's Boy ...	Souvenir of Wollongbar	Fairy Hill ...	— April, '16.
" ...	Belfast	King of the Roses	Flaxy 2nd ...	Tyalgum	29 Nov., '15
" ...	Royal Preel ...	Itchen Royal ...	Hayes' Lily du Preel (imp.).	Murwillumbah ...	30 Mch., '16.
" ...	Alexander the Great.	Claudius (imp.)	Alexandrina of Richmond.	Bowraville ...	28 Mch., '16.
Ayrshire ...	Wyllieland Bright Lad (imp.)	Wyllieland Gleniffer (7229)	Wyllieland Sangie	Glen Innes Farm..	*
" ...	Isabel's Majestic	Majestic of Oakbank.	Isabel of Glen-eira.	Grafton Farm ...	‖
Holstein ...	Sultan La Polka (imp. N.Z.)	King of Dominos (297 N.Z.H. & F.H.B.)	Princess La Polka (292 N.Z.H. and F.H.B.)	Berry Farm ...	*
Kerry... ...	Castle Lough Ranger (imp.)	Waterville Rover	Castle Lough Lizzie.	Bathurst Farm ...	*

*Available for service only at the Farm where stationed. † Available for lease or for service at the Farm where stationed.
‖ Available for special service where stationed upon application to the Under Secretary.

BULLS FOR SALE

AT BERRY EXPERIMENT FARM.

JERSEYS.—**Gnome** (37): born 11th March, 1914; colour, whole fawn; sire, Bridegroom; dam, Fairy Fay; by Thessalian II (192 A.J.H.B.), from Fay; by Golden Lord (imp.), from Fairy; by Coral's Lad, from Gertie: Bridegroom, by Best Man (220 A.J.H.B.), from Golden Omelette (438 A.J.H.B.). Price, **10 guineas.**

Nelson (602): born 27th March, 1914; colour, whole fawn; sire, Trafalgar; dam, Sailor's Pride (1366 A.J.H.B), by Sir Jack (188 A.J.H.B.), from Egyptian Belle (382 A.J.H.B.), by Tidy Punch (193 A.J.H.B.), from Egyptian Princess (imp.); Trafalgar, by Best Man (220 A.J.H.B.), from Rum Omelette (imp.) (210 A.J.H.B.). Price, **12 guineas.**

Rose Bay (603): born 12th April, 1914; colour, whole fawn; sire, Elaine's Heir; dam, Wagga Rosette (2786 A.J.H.B.), by Kaid of Khartoum, from Wagga Rose (794 A.J.H.B.); Elaine's Heir, by Thessalian II (192 A.J.H.B.), from Wagga Elaine (783 A.J.H.B.). Price, **15 guineas.**

Xmas Omelette (604): born April, 1914; colour, whole fawn; sire, Christmas Fox (imp.); dam, Golden Omelette (438 A.J.H.B.), by Sir Jack (188 A.J.H.B.), from Rum Omelette II (699 A.J.H.B.), by Golden Lord (imp.), (39 A.J.H.B.), from Rum Omelette (imp.) (210 A.J.H.B.). Price, **15 guineas.**

SHORTHORN.—**Go-Hon:** born 10th February, 1915; colour, red; sire, Come-back, of Darbalara; dam, Ruby VII, of Darbalara (passed Vol. IV, M.S.H.B.), by Emblem, of Darbalara, from Ruby, of Bolaro, by Shoalhaven. Price, **20 guineas.**

HOLSTEIN.—**Marshal Oyama:** born 7th August, 1914; colour, black and white; sire, Field Marshal; dam, Miss Muller, by Hollander, from Margosa; by Garfield (imp.), from Maggy Obbe; by Obbe (imp.), from Margaretha (imp.). Price, **18 guineas.**

Milk yield :—	Milk lb.	Fat per cent.	Butter lb.
Miss Muller, 273 days	8,700	3·37	334·29
Margosa, 213 days...	5,946	3·07	207·18
Maggy Obbe	7,699	—	271·75
Margaretha (imp.)	10,990	—	407

Field Artillery: born 14th August, 1914; colour, black and white; sire, Field Marshal; dam, Bercham, by Obbe II, from Lolkje Zuyder Zee; by President, from Lolkje Veeman (imp.); Field Marshal is by De Wet, from Lolkje Field; by Garfield (imp.), from Lolkje; by Joubert, from Lolkje Veeman (imp.). Price, **18 guineas.**

Milk yield :—	Milk lb.	Fat per cent.	Butter lb.
Bercham, 273 days	8,836	3·31	334
Lolkje Veeman (imp.)	11,996	—	479

AT GRAFTON EXPERIMENT FARM.

AYRSHIRE.—**No. 42:** born 27th March, 1914; colour, white and brown; sire, Jamie's Heir, by Jamie of Oakbank; dam, Belladonna of Russley, by Duke King of Ardgowan (imp.) from Belides; by Victor of Munnoch (imp.) from Bella (64 A.A.H.B.), by Gladstone from Beauty IV, by Cicero from Beauty III, by Nimrod from Beauty II, by Dunlop from Beauty (imp.). Price, **12 guineas.**

GUERNSEY COWS FOR SALE BY AUCTION

At the LISMORE SHOW.

(*Show postponed, date to be fixed.*)

Shamrock of Illawarra (182 A.G.H.B.): born 13th February, 1908; colour, orange and white; sire, Jap I (1785 P.S.R.G.A.S.); dam, Shamrock of les Vesquesses VI (imp.). (6829 P.S.R.G.A.S.).
Served by Peacemaker, 12th April, 1915.

Sweetheart (188 A.G.H.B.): born 7th January, 1909; colour, lemon, fawn, and white; sire, The Admiral; dam, Souvenir of Wollongbar, by Vivid's Prince from Souvenir (imp.); by Socialist (586 E.G.H.B.) from Necklace (2526 E.G.H.B.).
Served by Peacemaker, 3rd June, 1915.

Pet of Wollongbar: born 30th Dec., 1913; colour, dark fawn and white; sire, St. Michael of Wollongbar; dam, Darling (38) by Royal Preel of Wollongbar (imp.), from Sweetheart (188), by The Admiral, from Souvenir of Wollongbar; by Vivid's Prince from Souvenir (imp.).
Served by Peacemaker.

Angelica of Berry (5 A.G.H.B.): born 12th January, 1912; colour, orange and white; sire, Claudius (imp.); dam, Angelica VIII (imp.) (5630 P.S.R.G.A.S.), by Captain Powell (1430 P.S.R.G.A.S) from Angelica (749 P.S.R.G.A.S.).
Not served yet.

Flaxy IV (54 A.G.H.B): born 16th August, 1912; colour, lemon and white; sire, Rosehill (imp.) (2218 E.G.H.B.); dam, Flaxy III, by Lord Clatford (imp.) from Flaxy II; by Rose Prince (imp.) from Flaxy (imp.).
Served by Godolphin Moses (imp.), 9th July, 1915.

Constance (33 A.G.H.B.): born 26th April, 1912; colour, lemon and white; sire, Hayes' Fido (imp.); dam, Faith, by Prince Souvia from Miss Clatford of Wollongbar (imp.), by Clatford Hope II (1814 E.G.H.B.) from Clatford Hopeful (imp.).
Served by George III.

Golden May of Wollongbar (74 A.G.H.B.): born 4th September, 1912; colour, orange and white; sire, Hayes' Fido (imp.); dam, Miss Golden of Wollongbar, by Golden Star II (1751 E.G.H.B.) from Bijou de la Fontaine III (imp.).

Cato of Wollongbar: born 26th December, 1912; colour, orange and white; sire, Hayes' Fido (imp.); dam, Token, by Peter (imp.) from Souvenir (imp.), by Socialist (586 E.G.H.B.) from Necklace (2526 E.G.H.B.).
Served by Peacemaker.

GEORGE VALDER,
Under Secretary and Director of Agriculture.

Date of issue.	Date of issue.	Date of issue.